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A SYNTHESIS AND EVALUATION OF SUBJECT-MATTER TOPICS IN GENERAL SCIENCE

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A FOREWORD

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FRANCIS D. CURTIS.

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FOREWORD

This book presents a notable piece of work. So painstaking in method and detail is the study here presented that its results seem to merit the careful scrutiny of every one who is concerned with the problems of science teaching. Exactitude is antithetical to guessing. Too often have we been subjected to conclusions which when "back tracked" are found to rest upon guesses, not upon determined facts. The author has here endeavored not only to discover guidance in course construction in science through discovery of facts which will stand securely as guide posts, but also he has presented a standard for further such studies of related problems in this and other fields.

This is the first study of its kind. There have been many excellent analyses which help to determine subject-matter content. This is a synthesis of the available analyses and other relevant course materials dealing with a special subject. The quality and the magnitude of the computational work essential to the proper appraisal of the different elements of this synthesis may be suggested by the fact that Table VII presents several thousand separate items of information the determination of many of which demanded several separate computations.

The syllabi, the studies of textbooks, and other curricular studies which deal with the subject content of the general science course are synthesized. These sources are accepted as the foundational materials, this acceptance resting upon the evidence which is presented in the syllabi and the published reports of the studies themselves. It would be desirable, but not possible in this synthesis, to present added evidence as to how the authors of the source materials were led to their conclusions. In thus accepting the findings of the sources upon which this synthesis is based, it is not to be inferred that the author regards all the sources as of equal consequence and validity. These are, however, the main published reports of course content for introductory science instruction, hence are those most important to include in such a synthesis.

The major part of Dr. Curtis' volume deals with the analysis of his problem and his method of procedure, with abundant tabular presentation of data. By means of this method definite conclusions are drawn as to the various topics which the resulting synthesis indicates should

be included in a standard course in introductory science for high schools. The synthesis also makes it possible to grade these topics in the order of their indicated relative importance. The outcome of this study may reasonably be expected to be a much better guide than has yet been available in construction of courses in general science. It should be highly useful to all those who undertake to produce textual materials for school use in this subject.

No one need have fear that a too-standardized course will soon result from such studies as this. We need and must keep adequate plasticity for progressive development in the subjects of the curriculum. The standardization of a controlling examining body is not desired. On the other hand, it has too often been assumed that all possible plasticity is desired. We need to know what course content one connotes when he speaks of general science, and that connotation is provided by this investigation. That the contents thus established are quite similar to those already included in some of the most widely used courses is added support and encouragement to those who have developed their courses with perhaps less scientific exactitude than here used, but with a clear idea as to the service they hoped general science would accomplish for its students.

Thus is science really being used in the study of science teaching.

OTIS W. CALDWELL.

A SYNTHESIS AND EVALUATION OF SUBJECT-MATTER TOPICS IN GENERAL SCIENCE

Chapter I

THE PROBLEM

The Importance of the Problem

Content and method in all our present-day school subjects are undergoing a significant development. Abundant evidence is everywhere to be found indicating the simultaneous influence of three separate agencies, which are at the same time progressive stages of development — authority and opinion, speculation, and research. Because of the newness of scientific educational investigation, however, the third of these developmental stages, research, is only in its initial phases.

The development of general science to date furnishes an especially good example of this typical evolution of subject-matter content. This subject has made substantial progress within the first two of these developmental stages, authority and speculation, and is now advancing unmistakably into the early beginnings of the third stage, experimentation and research.

The truth of this statement becomes clear from a brief survey of the development of course content in general science. When the first modern textbooks in this subject were written less than twenty years ago, their materials were selected almost wholly on the basis of the author's opinion regarding what topics should be treated in such a course. There was at that time no alternative; there was then no other basis of subject-matter selection than authority or opinion. It should be remembered, however, that this opinion was neither arbitrary nor bigoted. At no time during the development of this subject has there been a more manifest eagerness on the part of the leaders to secure the best subject-matter possible and, by trying out their tentative courses in the classroom, to revise, eliminate from, and add to their syllabi as the apparent success with the pupils dictated. But it was inevitable,

nevertheless, that there should be in some of the earlier books a disproportionate emphasis upon the particular branch of science in which the author had specialized, or in which his major interest lay. Thus one early textbook dealt chiefly with chemistry, another with physiography, a third with physics, and so on.

Textbook followed textbook in rapid succession. New authors launched their books to compete with revisions of the earlier productions in this subject. Naturally each writer must have been more or less strongly influenced in his choice of subject-matter elements by the content of preceding successful textbooks in the field; inevitably the authority or opinion of the earlier authors must have continued, to a large extent, to influence the selection of topics to be included in later books. It is difficult on any other assumption to account for the fact that eighteen textbooks in general science published up to 1919 indicated "a fairly well established agreement among the authors of general science as to what subject-matter is appropriate." [1] By this time, however, the majority of authors of textbooks in general science had come to subordinate their individual convictions regarding what branch of science should have major emphasis, and to adopt a more uniform distribution of the course materials of general science among the various contributing branches. This distribution was, however, an unequal one: By far the greatest portion of these books was devoted to physics and the physical sciences.

But soon after authority or opinion began to mold the course content of general science through the textbooks, speculation began also to exert its influence. This second stage in the evolution of course content in general science was characterized by much discussion in the professional magazines, in the meetings of various associations of teachers of science, and in specially appointed committees. Such speculation still continues and it is hoped will continue indefinitely; for it has resulted in much benefit to the teaching of general science in all its phases.

It is interesting to note, however, that all this speculation effected no very radical changes in the course content of general science; the subject-matter continued to conform closely to that established by the authority or opinions of the writers of earlier textbooks in this field. A reason for this fact may be that the writers of these early textbooks, as unquestioned leaders in the general science movement, assumed a

[1] Hanor A. Webb, *General Science Instruction in the Grades* (Contributions to Education, No. 4: George Peabody College for Teachers, 1921), p. 18.

prominent part in the discussions of content, thus exerting powerfully their valuable influence through speculation as well as by authority.

At any rate, whatever the reason, by the beginning of the present decade a firm conviction in the superior merits of the subject-matter already developed seems to have become strongly established. Evidence that this conviction still holds is found in the fact that though nearly thirty textbooks in general science have appeared since 1920, the content of the recent ones is not very different from that of the earlier ones; such changes as appear consist chiefly in expanding the content already accepted as best suited to the subject, to include additional materials dealing with physiology and hygiene.[1] In fact, considerable justification could doubtless be found for this summary of the progress toward the selection of subject-matter in general science to date: Due almost wholly to the influence of authority and speculation, there is, thus early in the development of general science, unmistakable evidence of a tendency towards extreme conservatism resulting in a *standardization* of the course content of general science.

It should be clearly understood, however, that a statement to the effect that opinion and speculation have molded the subject-matter content of general science should not be assumed to be an indictment, or even a criticism of the existing course content in this subject. Such a statement does not imply a conviction that the subject-matter content of general science should necessarily be changed. It is of course true that physical material predominates over biological material in the general science textbooks merely because it has been the *opinion*, reinforced by *speculation*, of those who have established the course content of general science, that physical material should have major emphasis in this course. It may be that this opinion is correct. Certainly those "frontier thinkers" responsible for this opinion and speculation have been the ones best qualified to express opinion and engage in speculation on this subject.

But the fact must be kept clearly in mind that nobody *knows* whether the present generally accepted selection of materials for the course in general science is best. Nobody *knows* whether the present subject-

[1] Evidence supporting this statement is contained in an analysis by Overn, Iler and Heinemann, under the direction of Dr. E. R. Downing, of the subject-matter content of twenty-five textbooks in general science: Of twenty topics in general science, the only one which was among the first ten in importance in the books published prior to 1920 and which has been relegated to a position among the last ten in the textbooks published since 1920, is "Combustion and Fuels", while its place has been taken in the first ten by "The Human Body."

Overn, Iler, and Heinemann (Elliot R. Downing, Editor), "An Analysis of Textbooks in General Science," *General Science Quarterly*, XII (1928), 509–516.

matter content of general science is capable of being improved very much, little, or not at all.

To the extent, however, that progressive educators should be unwilling to accept as unquestionably appropriate, subject-matter materials which have been selected chiefly on the bases of authority and speculation, they should be equally cautious in advocating changes of any sort, whether great or minor, merely on these same bases. Furthermore, change is not justified merely for the sake of change, nor is change necessarily progress. Extreme radicalism may be quite as obstructive of true progress as extreme conservatism. Nobody is therefore justified in making any changes whatever in the content of general science, until he knows that he has something better. In any case, moreover, he should be conservative toward suggesting or making radical changes in the course materials which have thus far served so well.

Those who are interested in the progressive development of general science, however, cannot allow its subject-matter to remain as it is without challenging its appropriateness. Since, moreover, they must always recognize that authority and speculation are inadequate criteria both for establishing and for evaluating subject-matter, leaders in the field must seek to discover other criteria. These are to be found only in the results of educational investigation.

A search through the professional literature of recent years reveals a number of reports of curricular studies[1] of various sorts which bear a more or less intimate relation to sundry aspects of science in everyday life. Several of these are potentially of special significance to the problem of selecting appropriate subject-matter for general science. Thus far, however, little use has been made of them for this purpose.[2]

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[1] Under the caption of *curricular studies* are included "those studies which emphasize the materials which should be considered or stressed in teaching science. Those studies involve . . . the actual selection of materials for inclusion and emphasis in the curriculum." Francis D. Curtis, *A Digest of Investigations in the Teaching of Science in the Elementary and Secondary Schools* (Philadelphia: P. Blakiston's Son & Co., 1926). Preface, p. v.

[2] Some exception to this statement should be noted: The content of one of the earliest textbooks in general science was to some extent determined by children's interests as revealed by their questions; the content of another fairly recent one was based upon an analysis of children's scientific questions, of scientifically explainable facts common in everyday life, and of common applications of science to everyday life; the content of one of the syllabi used in the investigation here reported was based to a considerable extent upon the results of an analysis of newspaper and magazine science.

Statement of the Problem

The investigation here reported, therefore, represents an attempt (1) to combine the pronouncements of authority or opinion and the results of speculation, with the findings of published curricular studies, in order to secure an extensive list of subject-matter elements appropriate to general science; and (2) to determine, by means of a statistical technique, the relative values of these various subject-matter elements in so far, only, as authority, speculation, and the results of available curricular studies may reveal them.

Limitations of the Problem

This investigation is confined wholly to the problem as stated. All other considerations, such as curricular sequence, order of arrangement or of presentation of topics, methods of presentation of subject-matter, relative values with respect to the *effect* of learning subject-matter or training in scientific thinking which may be secured from teaching these various subject-matter topics, are wholly outside the scope of the study.

Chapter II

THE METHOD

Outline of the Method

The investigation described in the following pages is a "synthetic" curricular study. In such a study no attempt is made with analyses of any sort to unearth hitherto undiscovered source materials. A synthetic curricular investigation aims only to combine the data from analytical researches and other sources already available, and, by means of an appropriate statistical technique, to determine the relative values, within the limitations of the problem as stated, of all the subject-matter topics contributed by all the sources used.

There are various methods by which the data from contributing sources might be treated in such a synthetic curricular investigation. This discussion, however, aims to present only one method, that followed in this investigation. The successive steps in the treatment of the data are mentioned briefly at this point, and will be described fully in turn farther along in this chapter.

The Successive Steps in the Technique

I. The selection of contributing sources of data
II. The tabulation of the data from all the contributing sources preparatory to their statistical treatment
III. The determination of the relative importance or *ranks* of the topics within each contributing source
IV. The determination of the *weight* of each contributing source of data, relative to the respective weights of all the other sources
V. The determination of the *relative values* of all the topics within each contributing source
VI. The determination of the *aggregate value* of each topic by combining the respective relative values of that topic from all the sources
VII. The reduction of the *aggregate values* to percentages of the maximum possible aggregate value, for the sake of more ready comparison

A detailed description and explanation of these seven steps of technique follow:

Step I. The Selection of the Contributing Sources of Data

THE SEARCH FOR AVAILABLE SOURCES OF DATA

In an investigation of this type, it is necessary first of all to determine what existing sources of data unquestionably deal with the three kinds of materials, representing authority or opinion, speculation, and research, which must be synthesized. An exhaustive survey of the professional literature was therefore made for this purpose. The results of speculation, and, to a somewhat smaller extent, the expressions of authority or opinion, were found available in crystallized form in a great number of syllabi and outlines of courses in general science. Also the dictates of authority, and, to a somewhat smaller extent, the results of speculation, were discovered in conveniently brief and definite form in the reports of analyses of textbook content in the subject. The reports of research investigations, having greater or less relevance to the subject-matter content of general science, moreover, were found in encouraging numbers in the professional magazines, books, and monographs.

THE SELECTION OF SYLLABI REPRESENTING SPECULATION AND AUTHORITY

With the available sources of data at hand, it became necessary, next, to decide which should be used in the investigation. Obviously, because of the great number of computations introduced into a synthetic investigation by the inclusion of each additional source of data, not all of the available syllabi, analyses of textbooks, and curricular investigations offering pertinent data could be included. Some more or less arbitrary criteria of selection had to be set up to reduce the number of contributing sources of data sufficiently to make their synthesis practicable.

It was decided, therefore, to select from the great number of excellent syllabi available, only three. These three, however, must satisfy the following criteria:

Criteria Governing the Selection of Syllabi Representing Speculation and Authority

1. Each must be not more than two years old at the time this investigation was begun
2. Each must represent the pooled opinions of a competent committee of experts and specialists in general science

3. Each must represent the results of careful and extensive revision of earlier course materials in the light of classroom experience
4. Each must be prepared for an entirely different section of the country, and must therefore be adapted to a wholly different sort of local environment from those represented by the other syllabi

It was thought that syllabi satisfying these four criteria would doubtless be representative of the best available; but they could not, of course, be considered representative of all the various sections and environments of the country. It is certain, however, that the addition of several times this number of syllabi would not have assured perfect environmental representativeness; such values, moreover, as might have been secured in the direction of environmental representativeness by the inclusion of more syllabi, would probably not have justified the enormous number of computations which would have been introduced into this investigation by their inclusion.

Group A of the Contributing Sources of Data

The syllabi selected as fully satisfying these criteria were the New York Syllabus,[1] the Denver Syllabus,[2] and the Detroit Syllabus.[3] These three syllabi constitute Group A of the contributing sources of data used in this investigation.

A brief description of these, and of each of the other fifteen sources selected for this investigation, will be found in a later section in this chapter.

THE SELECTION OF THE REMAINING SOURCES OF DATA[4] REPRESENTING AUTHORITY AND SPECULATION, AND THE SOURCES REPRESENTING RESEARCH

The remaining sources of data for the investigation were all reports of analyses of various sorts. Since these reports were, like the syllabi, numerous, and were of widely different degrees of usefulness for the purpose of this investigation, it was necessary again to set up criteria of selection:

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[1] *Syllabus in General Science*, University of the State of New York Bulletin, No. 821 (Albany: The University of the State of New York Press, 1926).

[2] *General Science*, Course of Study Monograph, No. 2 (Denver: Public Schools, 1924).

[3] *General Science Outline*, Detroit Public Schools. This is the mimeographed edition, preceding the present *Course of Study in General Science, Intermediate Schools* (Detroit: Board of Education, City of Detroit, 1927).

[4] This investigation was begun in the fall of 1926, and therefore embodies no studies published since that time.

Criteria Governing the Selection of Reports of Analyses

1. The available report must contain a more or less *detailed* list of subject-matter items determined from the investigation
2. The report should indicate the relative frequency of appearance, or degree of stress given in the analyzed materials to each of the definitely named subject-matter items included

It would be impossible in an investigation of this sort to make practical use of any reports of analyses which failed to satisfy the first of these two criteria; for, in general, the value of any curricular study for purposes of course construction or revision depends upon the degree of detail with which the course items which the analyst has discovered are presented by him in his report. To illustrate, it may be interesting to learn that a certain percentage of analyzed material pertains to "animal materials," or to "plant materials," or to "miscellaneous materials"; but from the standpoint of the individual who desires to use the results of such curricular researches in constructing or revising a course, such a report has *no* practical value whatever. Such a report possesses only *slight* value, moreover, if it merely goes into sufficient detail to state that a certain percentage of the "animal materials" discovered deals with "wild animals" and the rest with "pets"; the report possesses *greater* value if it states that these "wild animals" are specifically "bears" and "wolves"; and it possesses *still greater* value if it states definitely that the analyzed materials discuss "hibernation of bears" and "hunting habits of wolves."

Satisfying the second of these criteria, namely, that the report of the study should indicate the relative stress given to each of the subject-matter items included in the analyzed materials, adds greatly to the value of a study for purposes of course-making or revision. Yet there are several studies, e.g., Washburne's analysis,[1] which are valuable for these purposes because they satisfy the first criterion, namely, that the report must contain a detailed list of objectively determined subject-matter items, even though they do not satisfy the second criterion.

Group B of the Contributing Sources of Data

Three published reports of analyses of textbooks, those by Howe,[2] Webb,[3] and Weckel,[4] satisfied both criteria. But inasmuch as the

[1] Carleton W. Washburne, *Scientific Method in the Construction of School Textbooks*. World Book Company, Publishers, Yonkers, New York.

[2] C. M. Howe, "Can and Should General Science be Standardized?" *School Science and Mathematics*, XIX (1919), 248–255.

[3] Hanor A. Webb, *op. cit.*

[4] Ada L. Weckel, "Are Any Principles of General Science Evidenced by the Present Textbooks in the Subject?" *School Science and Mathematics*, XXII (1922), 44–51.

most recent of these published reports failed to include any textbook published since 1921, it seemed desirable to secure the results of an analysis of later textbooks. Fortunately there was available an unpublished analysis by Miller[1] of seven textbooks on general science, six of which were published between 1921 and 1924. There were likewise available unpublished analyses of textbooks on general science which were much more extensive than Miller's and which included recent textbooks along with older ones; but it was thought that Miller's study would best supplement the three published analyses, and would not at the same time introduce further duplication of the textbooks which had been analyzed in the published studies.

These four analyses of textbooks constitute Group B of the contributing sources of data used in this investigation. Eleven other investigations were selected as satisfying the first of these criteria, that their published reports should contain among the findings a more or less complete list of subject-matter elements revealed by the analysis, and all but two of these eleven also satisfied the second criterion, that the report should indicate the relative importance of these subject-matter items in the materials analyzed. Nine of these eleven studies were placed in two more or less homogeneous groups of respectively six and three studies, which constitute Groups C and D of the contributing sources of data combined in this investigation.

Group C of the Contributing Sources of Data

Group C consisted of six analyses of scientific interests reported by Pollock,[2] Washburne,[3] and Curtis.[4,5] The study by Pollock and the four by Curtis were of the same general type; that by Washburne was somewhat different, but was deemed to be sufficiently similar to warrant its inclusion with this group.

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[1] Robert James Miller, *The Content of General Science*, Unpublished Master's Thesis, Iowa State University, 1924.

[2] C. A. Pollock, "Children's Interests as a Basis of What to Teach in General Science," *Ohio State University Educational Research Bulletin*, III (January 9, 1924), 3–6.

[3] Carleton W. Washburne, *Scientific Method in the Construction of School Textbooks*. World Book Company, Publishers, Yonkers, New York.

[4] Francis D. Curtis, *Some Values Derived from Extensive Reading of General Science*. Teachers College Contributions to Education, No. 163 (New York: Teachers College Bureau of Publications, 1924).

[5] Francis D. Curtis, "A Study of the Scientific Interests of Dwellers in Small Towns and in the Country." This study was unpublished at the time the present investigation was begun, but was later published in the *Peabody Journal of Education*, V (1927), 22–34.

Two separate investigations are included in each of these last two references.

Group D of the Contributing Sources of Data

Group D consisted of the three published reports of analysis of magazine or newspaper science reported by Finley and Caldwell,[1] Searle and Ruch,[2] and Curtis.[3],[4]

Groups E and F of the Contributing Sources of Data

The two remaining sources of the eighteen included in this investigation were so different in nature from all the rest as to demand separate consideration. These were the study by Harap,[5] and the Report of the Cleveland Schoolmasters Club.[6] These two studies were respectively designated for purposes of convenience as Groups E and F.

A brief description of each of these eighteen sources of data follows:

DESCRIPTION OF THE SYLLABI CONSTITUTING GROUP A

The New York State *Syllabus of General Science* is the result of more than a year's work by a committee of five, appointed by the State Department of Education to draft a three-years' course in general science. This committee combined the material from syllabi of other states and many cities "with the fundamentals of the majority of present-day texts in general science modified by what the committee has found to be practicable and desirable from the standpoint of experience." Required topics are starred (*) in the syllabus, optional topics which are "strongly recommended for study" are marked with a dagger (†), and the remaining optional topics are unmarked.

The Denver *Syllabus of General Science* for grades seven and eight represents two years' work by a committee under the guidance of Professor L. Thomas Hopkins. It embodies along with other materials the results of Professor Hopkins' analysis of magazine and newspaper

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[1] Charles W. Finley and Otis W. Caldwell, *Biology in the Public Press.* (New York: The Lincoln School of Teachers College, 1923).

[2] A. H. Searle and G. M. Ruch, "A Study of Science Articles in Magazines," *School Science and Mathematics,* XXVI (1926), 389–396.

[3] Francis D. Curtis, *Some Values Derived from Extensive Reading of General Science* (New York, 1924) p. 19.

[4] The report of the study of newspapers and magazine science by L. Thomas Hopkins, "A Study of Magazine and Newspaper Science Articles with Relation to Courses in Science for High Schools," *School Science and Mathematics,* XXV (1925), 793–800, failed to include the list of topics determined from the analysis. An attempt to secure this list resulted in its obtainment too late to be included in this investigation. These data, however, exerted a pronounced influence upon the content of the Denver Syllabus, which is one of the three syllabi used in this investigation.

[5] Henry Harap, *The Education of the Consumer* (New York: The Macmillan Co., 1924).

[6] Committee Report on Science in Greater Cleveland, *School Science and Mathematics,* XXV (1925), 605–610.

science. No designation is used in the syllabus to indicate whether certain topics are to be considered as essential and others optional.

The Detroit *General Science Outline for the Intermediate Schools* for Grades Seven, Eight, and Nine is the detailed mimeographed outline embodying the revision of "the general outline given by Mr. Pieper of the University of Chicago, and outlines of specific units by general science instructors." This outline was prepared by a committee composed of the Supervisor of Exact Sciences of Detroit, and the Heads of Exact Science Departments in two intermediate schools of Detroit. Topics are listed as essential problems, and "extra problems and points that may be used for reports and further study for brighter pupils."

DESCRIPTION OF THE ANALYSES OF TEXTBOOKS CONSTITUTING GROUP B

Howe analyzed textbooks, syllabi, and courses in general science to find the subject-matter elements contained. He submitted a list of the topics which he had discovered, to 80 teachers who marked those topics which they considered essential. In his report Howe lists the subject-matter topics together with the number of teachers who deemed each topic essential.

Webb analyzed the subject-matter content of 18 general science textbooks published prior to 1919. In his report he lists the topics under appropriate headings, together with the number of books in which each topic appeared, and the number of pages which were devoted to each topic.

Weckel analyzed the subject-matter content of 14 textbooks in general science published prior to 1921. In her report she lists the topics together with the number of textbooks in which each topic was treated.

Miller analyzed the subject-matter content of 7 textbooks in general science, one published in 1917 and the rest from 1921 to 1924. In his report he lists the topics together with the average number of pages per book devoted to each topic.

DESCRIPTION OF THE ANALYSES OF QUESTIONS CONSTITUTING GROUP C

Pollock analyzed 3500 questions secured from 700 children who were studying eighth-grade general science in 13 schools in Columbus, Ohio. In his report he lists along with the topics the number of questions asked about each.

Curtis analyzed (1) 3330 questions about scientific materials secured from 687 children, living in New York City, Okmulgee (Oklahoma), and Portland, Salem and Baker (Oregon), and (2) 3232 similar questions secured from 705 adults living in these same cities. In his report he lists the topics determined from each of these two separate analyses with the respective numbers of questions asked about each topic.

Washburne analyzed (1) about two thousand questions about scientific materials collected from pupils in the elementary department of the San Francisco State Normal School, and from pupils of the San Francisco public schools; (2) a list of scientifically explainable facts "common in the experience of most people"; this list was obtained by asking students in the San Francisco State Normal School to jot down facts or principles which could be explained in terms of any scientific principles; and (3) experiences involving practical applications of science in the daily lives of friends, fellow faculty members and students. In his report Washburne lists the topics without numerical data, in the form of an outline for a textbook in general science.

Curtis analyzed (1) 1618 questions about scientific materials secured from 321 ninth grade boys and girls, and (2) 1646 questions secured from 386 adults. About two-thirds of the individuals in each group lived in the country and the other third in 32 small Michigan towns, having a median population of 309 inhabitants. In his report the investigator lists the topics determined from each of these two separate analyses, indicating the respective numbers of questions asked about each topic.

Description of the Analyses of Newspapers and Magazines Constituting Group D

Finley and Caldwell analyzed 3061 biological articles appearing in the complete issues for an entire month of each of 17 prominent newspapers, representative of various kinds of newspapers and parts of the country. In their report, the investigators list the topics which their analysis revealed, indicating the number of articles and the total number of columnar inches devoted to each topic.

Curtis analyzed 630 miscellaneous scientific articles appearing in 83 complete issues of 6 daily newspapers. He lists the number of these articles which he found to be devoted to each of 23 "classifications more commonly treated in the general science texts."

Searle and Ruch analyzed the articles dealing with science in 10 years' files of 9 American magazines of general character together with 5 years' files of a popular weekly and of each of 2 scientific magazines. In their report, the investigators list the topics under the major branches of science, physics, chemistry, biology, etc.; they indicate, also, the percentage the number of words used in discussing each topic is of the total number of words devoted to the major branch of science under which the topic is listed.

DESCRIPTION OF THE ANALYSIS OF COMMODITY CONSUMPTION CONSTITUTING GROUP E

Harap analyzed a great number of studies and statistical reports throwing light upon "what the people actually do in the process of consuming food, clothing, shelter, and fuel," and upon standards of what should be known and done about these commodities. In his report, he makes comparisons between present actual practice and efficient practice with respect to these commodities. He lists his conclusions as educational objectives, without indicating their relative importance.

DESCRIPTION OF THE COMMITTEE REPORT CONSTITUTING GROUP F

The Cleveland Schoolmasters' Club Committee on General Science prepared a list of 50 topics which they presented to the entire Committee on Science for approval. They then presented this list of topics to tenth-grade pupils, each of whom was asked to indicate which of the terms he considered to be useful to him in some way in his work, play, reading, etc. In the report, the 50 topics are listed as terms, together with the percentage of pupils who considered each term useful to them.

Step II. The Tabulation of the Data

Table I indicates the manner in which the data from the eighteen contributing sources were tabulated, in preparation for their statistical treatment. The New York syllabus was selected to begin with because it seemed to the author to list a greater number of subject-matter topics than any of the other seventeen sources; later, however, the Denver syllabus was found to contain more topics.

TABLE I

The Method of Tabulating the Data from the Various Contributing Sources[1]

TOPICS	New York	Denver	Webb	Pollock	Searle and Ruch	Cleveland
The weather	✓	✓			1.9	
superstitions and weather signs	✓	✓				
origin of weather lore		✓				
effects upon people	✓					
weather factors	*	✓				
temperature	*	✓				68.5
thermometer	✓	✓	18			
construction		✓				
air pressure	*	✓	17			
wind	*	✓	17	86		65.8
causes	✓					

[1] This table is intended merely to show the method of tabulating the data and therefore shows data from only 6 of the 18 contributing sources used in the investigation, and relative to only 11 of the 1850 topics secured from all the sources.

The topics from the New York syllabus were written in their original outline form at the left-hand side of the sheet. A star (*), a dagger (†), or a check (✓) was placed in the first small column at the right, marked "New York," opposite each topic designated in the New York Syllabus respectively as required (*), "strongly recommended for study" (†), or optional (✓).

When all the topics in the New York syllabus had been properly entered and designated, the items from the Denver syllabus were added to the outline thus: A check (✓) was placed in the second column, designated as "Denver," opposite every item which appeared in the Denver syllabus and which had already been copied from the New York syllabus. When all the topics which the Denver syllabus had in common with the New York syllabus had been checked in the Denver column, the remaining topics of the Denver syllabus were added at appropriate places to the outline copied from the New York syllabus. A check was then placed in the Denver column opposite these items. (See Table I, in the "Denver" column, *origin of weather lore* and *construction*).

When all the items from the Denver syllabus had thus been added, a similar procedure was followed in turn with the Detroit syllabus, and with each of the remaining 15 contributing sources. In all but 2 of the analyses, however, numerical data of some sort, indicating the relative importance of the various topics found by the respective analysts, were

included in the report; these data were entered in their proper places in this tabulation in place of the stars, daggers, or checks used for items from the three syllabi. Thus, the topics from the Howe study were designated in the "Howe" column by the number of teachers who marked each topic essential; the topics from the Webb study were indicated in the "Webb" column by the number of textbooks in which Webb found the topics; those from the analyses of scientific interests by Pollock and Curtis were designated by the number of questions which were asked about each particular topic; those from the Searle-Ruch study and the Cleveland Report, by percentages, and so on. (See Table I.)

Occasionally in the various sources, items were found which, though apparently identical in meaning and purpose, were worded so differently as to make it difficult to determine with certainty whether they should be considered as the same or as different topics. The writer discussed all such cases with another teacher of general science, and recorded the topics in the outline as identical only when both he and the other teacher were agreed that the topics should be so considered.

When all the data from the 18 contributing sources had been added according to this plan, the composite outline was re-examined and checked by the writer. He then submitted the entire outline to three other teachers, one of whom had taught and the other two were then teaching one or more branches of high school science. These teachers examined the outline critically to insure, first, that the position in the outline in which the investigator had fitted the additional topics from successive sources of data was *defensible*, and secondly, that no topic appeared more than once in the outline unless the respective differences in its connotations at the two points clearly demanded that it be considered as two separate topics.

The complete list of subject-matter elements in general science secured from the 18 contributing sources was found to contain 1850 topics.

Step III. The Determination of the Ranks of Topics Within Each Contributing Source

The next step involved the determination of the **rank** of each item in each respective source in which it was found. The rank of any given item in any source was of course dependent upon the numerical value, or other designation of relative importance, assigned to that particular topic in the source. Thus the relative ranks of topics in the New York

syllabus depended upon whether the topics were starred or were marked with a dagger, or with a check; in the Howe study, upon the respective numbers of teachers who considered the topics essential; in the Pollock study, upon the respective numbers of questions bearing upon the various topics; in the Searle-Ruch study, upon the respective percentages of material devoted to the various topics, and so on.

A glance at Table I, however, reveals the fact that some of the topics which appeared as major topics in the composite outline were not listed in some of the contributing sources, while other subject-matter items, which found minor positions in the composite outline, were given values in these contributing studies. For example, *temperature* and *wind* appear in the Cleveland Report, while *weather factors* and *The Weather* do not. Yet in the composite outline *temperature* and *wind* are sub-topics under *weather factors* which is itself a sub-topic under *The Weather*. If this composite outline is defensible, it seems reasonable to assume that no minor topic in any contributing source should possess a greater numerical value and hence a higher rank than the major topic under which it is placed in the outline. Under this assumption each major topic in each contributing source was given the highest numerical value or designation assigned to any minor topic under it in the same study, provided the major topic did not already possess a higher value in that study. Thus, in the Cleveland Report, *weather factors* and *The Weather* are assumed to be entitled to the highest numerical value assigned to any minor topic under them; therefore both these topics were given the value of *temperature*, 68.5. (See Table II.)

Similarly in the Webb Study, (Table I) *thermometer* has a value of 18, since it was found in all 18 textbooks analyzed. But *temperature*, *weather factors*, and *The Weather*, under all of which in the outline *thermometer* is a sub-topic, are not specifically mentioned in the Webb data. Hence, in Table II, these three topics were assigned the same numerical value as *thermometer*, 18. Again, *The Weather* was not mentioned in the data from the Pollock study (Table I) though some other topic, which in the complete composite outline became a minor topic under *The Weather*, was represented in that study by 157 questions. Hence, in Table II, *The Weather* was likewise assigned a value of 157 in the "Pollock" column.

In Table II, all values which were assigned in this manner are enclosed in parentheses.

The objection may be raised at this point that the assignment of topics to positions of major or minor importance in the outline was

TABLE II

The Method of Assigning to Unevaluated Major Topics the Highest Numerical Values of Minor Topics under Them

TOPICS	New York	Denver	Webb	Pollock	Searle and Ruch	Cleveland
The Weather	(*)	✓	(18)	(157)	1.9	(68.5)
superstitions and weather signs	✓	✓				
origin of weather lore		✓				
effects upon people	✓					
weather factors	*	✓	(18)	(86)		(68.5)
temperature	*	✓	(18)			68.5
thermometer	✓	✓	18			
construction		✓				
air pressure	*	✓	17			
wind	*	✓	17	86		65.8
causes	✓					

arbitrary, since no other investigator would have fitted all the topics contributed by the eighteen sources into exactly the same positions in the composite outline to which the writer assigned them. This objection is to some extent valid. Yet it must be borne in mind that there is probably no arrangement of topics in general science which *any* two individuals would accept as unquestionably correct or best at every point. It must furthermore be remembered that the final outline which grew out of this investigation was a synthetic one, of which the New York syllabus happened to be used as the nucleus. The general arrangement of topics, though subsequently modified as need arose with the addition of topics from other sources of data, was therefore roughly fixed by the New York syllabus, and not by the whim of the writer. To be sure, the particular point where each additional item was fitted into the framework furnished by the New York syllabus was necessarily decided arbitrarily by the writer; but all these placements were subsequently approved as *defensible* by three competent subject-matter specialists. Furthermore, in every case in which any one of these three specialists objected to the position in the outline assigned to an item by the writer, the item was shifted to another position which was unanimously approved as defensible. It seems reasonable to believe, therefore, that no topic had its numerical value in any source increased to equal that of some topic placed under it in the composite outline, unless this latter topic might reasonably be regarded as a sub-topic of the former.

The topics in each source were next assigned ranks beginning with

1850 for the topic having the largest value in the source, and continuing downward until the correct rank had been assigned to every topic having a numerical value or designation of relative value in the source.

None of the reports of the contributing sources actually listed more than 830 of the 1850 topics secured from all the sources. But, assuming that the eighteen contributing sources are all appropriate sources of course materials in general science, then all the topics which appear in the final synthetic outline must likewise be appropriate to general science. Furthermore, the failure of any source to name and to designate a value for every one of these 1850 topics must be due to one or both of the following reasons: (1) The sampling of materials from which the data were secured was not sufficiently representative or exhaustive to reveal all of these 1850 topics; or (2) the report of the investigation was too brief to include all of the topics which the investigation may have revealed.

It was accordingly deemed appropriate to assume that the topics named in each source were the most important within that source, *i.e.*, those which the pooled opinions of the syllabus makers, or which the data of the investigation designated as having the highest values. The smaller the number of topics actually named in a given source, therefore, the greater the importance of each within that particular source; in other words, a topic is of relatively greater importance if it is named as one of fifty in a source than if it were named as one of five hundred in the same source. Not to be named in a source, however, does not mean that an item possesses no value whatever in that source; it merely means that no value was assigned the item in the source, for one or both of the two reasons stated above.

Under the above assumptions, therefore, in each of the eighteen sources those of the 1850 appropriate topics which are definitely named in the data possess definite values, while the rest of the 1850 topics, those which are not named in the data, must all be considered as having the same relatively small value, in so far as that source is concerned. The rank of each of these unnamed items in any given source must accordingly be considered to be the average of the ranks remaining after the named topics in that source have all been assigned ranks from 1850 downward. For example, the data from the Searle and Ruch study, when completely tabulated as in Table II, assigned relative values to 89 of the 1850 topics, but made no mention whatever of the remaining 1761 contributed by all the sources. These 89 topics were assigned ranks from 1850 downward including 1762. Since there was

no way of determining what relative values the 1761 unnamed topics would have had in the Searle and Ruch study had it been extensive enough to reveal them, or had the report of it been sufficiently detailed to include them, each of these topics was given a rank equal to the average of the 1761 remaining ranks, or 881. To illustrate further, the data from the Pollock study designated 214 topics, but made no mention whatever of the remaining 1636 topics. These 214 named topics were accordingly assigned the first 214 ranks downward from 1850, while all the unnamed 1636 items were then given the average of the remaining 1636 ranks, or 818.5.

Each item in the three syllabi, with no assigned numerical values to show the relative importance of items included in a group such as the starred (essential), the daggered (strongly recommended), or the checked (optional) topics, was given a rank equal to the average of all the ranks included by that group. Thus, each of the 208 starred items in the New York syllabus was assigned the rank of 1746.5, which is the average of the first 208 ranks downward from 1850 to 1643 inclusive; each of the 52 daggered items in this syllabus was assigned the rank of 1616.5 which is the average of the 52 ranks downward from 1642 to 1591 inclusive; each of the 410 checked items was assigned the rank of 1385.5, which is the average of 410 ranks downward from 1590 to 1181 inclusive; and each of the remaining 1180 in the entire outline which were not named in the New York Syllabus was given the rank of 590.5, the average of the ranks from 1180 to 1 inclusive. To illustrate further, the 830 topics in the Denver syllabus were given no designations of relative importance by means of stars or other symbols. Each of these items was therefore assigned the rank of 1435.5, which is the average of 830 ranks downward from 1850 to 1021 inclusive. The 1020 items in the entire outline which were not named in the Denver syllabus were each assigned the rank of 510.5, which is the average of the ranks from 1020 to 1 inclusive.

Table III illustrates the third step in the technique, the assignment of the proper rank to each item in every source.

TABLE III

The Method of Assigning Ranks to Each Topic in Every Source

TOPICS	New York	Denver	Webb	Pollock	Searle and Ruch	Cleveland
The weather	1746.5	1435.5	1845.5	1842.0	1819.0	1845.5
superstitions and weather lore	1385.5	1435.5	728.5	818.5	881.0	880.5
origin of weather lore	590.5	1435.5	728.5	818.5	881.0	880.5
effects upon people	1385.5	510.5	728.5	818.5	881.0	880.5
weather factors	1746.5	1435.5	1845.5	1831.5	881.0	1845.5
temperature	1746.5	1435.5	1845.5	818.5	881.0	1845.5
thermometer	1385.5	1435.5	1845.5	818.5	881.0	880.5
construction	590.5	1435.5	728.5	818.5	881.0	880.5
air pressure	1746.5	1435.5	1835.5	818.5	881.0	880.5
wind	1746.5	1435.5	1835.5	1831.5	881.0	1837.0
causes	1385.5	510.5	728.5	818.5	881.0	880.5

Step IV. The Determination of the Weights of the Eighteen Contributing Sources

The next step in the investigation involved the determination of the relative values or **weights** of the various contributing sources of data.

Since all of the sources were obviously not equally representative, comprehensive, exhaustive, or objective, it became necessary to secure a relative evaluation or weight of these various sources, in order to determine whether a subject-matter item derived from one source was to be considered of more or less importance than another subject-matter item secured from another source. It was decided to determine the relative weights of the various sources by combining the independent judgments of competent individuals. These were 26 teachers of science in high schools and colleges, who were thoroughly familiar with the field of general science, and who were enrolled as graduate students in the writer's seminar, "Problems in the Teaching of Science in the Elementary and Secondary Schools." They met with the writer and made a thorough study of the eighteen sources of data, becoming familiar through free discussion with the nature, scope, limitations and merits of each of the sources.

In order to insure a common basis for all the weightings, it was decided that each individual should give the New York syllabus an arbitrary value of 12 points,[1] and each of the seventeen remaining

[1] The number, 12, was selected because it was deemed sufficiently large to insure that all eighteen sources would be given positive values by all the evaluators, and sufficiently small to insure convenient numbers for computation.

sources a weight representing the evaluator's opinion of its worth in the investigation, relative to that of the New York syllabus.

Some of the questions and basic considerations which arose and were discussed in the class preliminary to the independent weighting of the various sources by the 26 specialists follow. The ones here listed are intended merely as representative samples of these questions and considerations, and not as an exhaustive list:

QUESTIONS AND CONSIDERATIONS AFFECTING THE RELATIVE WEIGHTS OF THE VARIOUS CONTRIBUTING SOURCES

Before one may intelligently make a decision regarding the number of points to be assigned the Denver and the Detroit syllabi as compared with the 12 points assigned to the New York syllabus, one must consider the methods followed in preparing the respective syllabi, and the relative importance of the syllabi in terms of the approximate numbers and the ranges of environments of the pupils whom the syllabus is likely to serve. One must remember also that the differentiation of topics in the New York and Detroit syllabi insures a higher rank to the starred topics than would be held by any topics in the Denver syllabus, since none of the latter are starred.

What weight should be given to the Webb study on the basis of 12 points assigned to the New York syllabus? In other words, what are the relative values of these two contributing sources which are so different in character and purpose; or stated differently, what should be the relative values of the New York syllabus and the Webb analysis of textbooks to the person wishing to use these materials in constructing a course in general science? After a weighting for the Webb study relative to the New York syllabus, as the common standard for all the sources, has been decided upon, what relative weightings should be given to the remaining three textbook analyses?

Probably there is considerable duplication of textbooks used in the four different textbook analyses. For example, it is probable that various editions of the same textbooks were included in two or three, or possibly in all four of these analyses. This probability must be taken into account in assigning a weight to each of these analyses, since the contributions from the duplicated textbooks will exert an added influence in shaping the composite outline, with each subsequent textbook analysis in which those particular books appear.

Should Howe's analysis be assigned a greater or a smaller weight because he reports along with the list of topics which his analysis revealed their relative values in terms of teacher judgment?

Are recent textbook analyses worth more than older ones and therefore should the more recent studies be given greater weights, as was done in the California Curriculum Study?[1] For example, Webb's study involves two and one half times as many textbooks as Miller's, but Miller's is five years later.

[1] William C. Bagley and George C. Kyte, *The California Curriculum Study* (Berkeley, California: University of California Printing Office, 1926). p. 163.

In this case, then, to what extent, if any, is the recency of Miller's study an offset for the greater number of books considered in Webb's study?

The magazine and newspaper analyses, the interest studies, the Cleveland Report, and the textbook analyses indicate the relative importance of the topics found in them; the syllabi, the Washburne study, and the Harap study list their topics in large groups with all in the same group having the same rank. Thus *temperature* and *wind* (Table III) have the same rank in the Denver syllabus, and this rank (1435.5) is the highest which any topic can have in that syllabus; but in the Webb study these same topics have ranks of respectively 1845.5 and 1835.5, each of which is considerably higher than any rank possible in the syllabi, the Harap study, or the Washburne study. It will be seen, then, that when the weights and ranks are combined in the next step of the method, a topic having a high rank in a study which has been assigned a relatively small weight but in which the topics have differentiated values, may assume more importance than any topic in another source in which the topics are not assigned relative values, though the latter source may have a relatively large weight.

In the textbook studies many of the same items appear in all four studies, and hence, if the weighting of those studies is too high, an item which appears in a great many texts in each of the four studies may gain a total of points disproportionately high. On the other hand, it *may* be desirable to weight the textbook studies heavily so that they will exert sufficient influence on the whole weighting scheme that the composite outline determined finally from all the contributing sources will not differ *too* radically from successful textbooks already tried out.

Pollock's and Curtis' studies of city children's interests involved about the same number of children, but the former study sampled only one city while the latter sampled several representing three widely separated parts of the country. How should this fact affect the respective weights of the studies?

Which of Curtis' studies of interests is worth more for the purposes of this investigation, those of adults or of children? Which likewise are worth more, the studies involving individuals living in the city or in the country?

There were only about half as many country dwellers represented in the second Curtis study as city dwellers in the first, but two thirds of these country people lived on farms, while the rest lived in 32 very small, scattered Michigan towns. To what extent, if any, is the disadvantage of the smaller number of individuals represented in the latter study, offset by their wider distribution?

Harap's study is so different from all the others that it presents a unique problem. Though it is by far the most exhaustive of all the studies, yet its scope is so narrow that it will make very few contacts with the other seventeen sources. Weighting it too heavily might result in giving too much importance to relatively unimportant items connected with food, shelter, clothing, and fuel, since all topics in the study have the same rank; such weighting might throw out of balance that portion of the final outline dealing with these four topics. At the same time, the commanding merit of the study demands that it exert its proper influence upon the final outline.

The analyses of interests (Group C), the newspaper and magazine studies (Group D), and the Harap study (Group E) are the sources which will exert

the greatest *modifying* influence upon existing courses in general science (represented by Groups A, B and F), since they are most apt to present data differing in topics and in emphasis from the textbooks and syllabi. How much, then, should they be weighted so as to allow them the proper influence upon the conventional course materials?

In assigning weights to these various contributing sources it is essential, however, to keep in mind the six *groups* of sources, lest one assign a disproportionate total value to the groups containing the greatest number of sources.

Finley and Caldwell analyzed about five times as many newspaper articles as Curtis, and listed the topics with which the articles dealt, in much greater detail. Finley and Caldwell's articles, however, dealt only with biology, while Curtis' included all branches of science discussed in the newspaper issues which he analyzed. To what extent, if any, is the smaller number of articles in the latter study offset by its greater scope?

Following these extensive discussions of all the contributing sources of data, each of the twenty-six evaluators and the writer gave an independent weighting to each of the sources relative to the 12 points assigned to the New York syllabus. The median number of points assigned to each study was then taken as the weight of the study.[1] These medians are shown in Table IV.

TABLE IV

Median Weights and Ranges of Weights Assigned to the Eighteen Contributing Sources of Data by Twenty-seven Evaluators

Source of Data	Median	Range
New York syllabus	12.0	12–12
Denver syllabus	7.3	3–20
Detroit syllabus	8.9	3–15
Howe, textbook analysis	7.8	3–20
Webb, textbook analysis	5.4	2–16
Weckel, textbook analysis	4.9	2–12
Miller, textbook analysis	6.1	3–10
Curtis, city children's interests	8.5	2–16
Curtis, city adults' interests	7.4	3–16
Washburne, interests and applications	3.5	2–10
Pollock, city children's interests	5.8	2–10
Curtis, country children's interests	6.7	2–13
Curtis, country adults' interests	6.5	2–12
Finley-Caldwell, newspaper	5.7	2–13
Curtis, newspaper	4.5	2–12
Searle and Ruch, magazine	8.7	2–14
Harap, statistical reports	5.7	3–15
Cleveland report	2.0	1–6

[1] The median value was taken instead of the mean, because it was thought desirable, since only 27 evaluations were available, to use a point measure which would diminish the influence of extreme evaluations.

Table V shows the totals of the median weights assigned to the sources composing the six respective groups. It will be noted that the twenty-seven evaluators gave a greater *combined* weight to Groups C, D and E than to Groups A, B and F. This fact may be interpreted as indicating the conviction of these specialists that the results of educational research should be allowed to exert a strong modifying influence upon the conventional course content of general science.

TABLE V

The Respective Total Weights of the Six Groups of Contributing Sources of Data as Computed from Table IV

GROUP	Total Weight
A. Syllabi	28.2
B. Textbook analyses	24.2
C. Interests studies	38.4
D. Newspaper and magazine analyses	18.9
E. Harap's study	5.7
F. Cleveland report	2.0
	117.4

Step V. The Determination of the Relative Values of the Topics in Each Contributing Source

The **relative values** of all the topics in each source were determined from Steps III and IV by multiplying the **rank** of each topic by the **weight** assigned to the source by the twenty-seven evaluators (Table IV). To illustrate, in Table I, *wind* is a starred item in the New York

TABLE VI

The Determination of the Relative Value of Each Topic from the Product of the Rank of the Topic and the Weight of the Source

TOPICS	New York	Denver	Webb	Pollock	Searle and Ruch	Cleveland Report
The Weather	20958.0	10479.2	9965.7	10683.6	15825.3	3691.0
superstitions and weather signs	16625.0	10479.2	3933.9	4747.3	7664.7	1761.0
origin of weather lore	7086.0	10479.2	3933.9	4747.3	7664.7	1761.0
effects upon people	16625.0	3726.7	3933.9	4747.3	7664.7	1761.0
weather factors	20958.0	10479.2	9965.7	10622.7	7664.7	3691.0
temperature	20958.0	10479.2	9965.7	4747.3	7664.7	3691.0
thermometer	16625.0	10479.2	9965.7	4747.3	7664.7	1761.0
construction	7086.0	3726.7	3933.9	4747.3	7664.7	1761.0
air pressure	20958.0	10479.2	9911.7	4747.3	7664.7	1761.0
wind	20958.0	10479.2	9911.7	10622.7	7664.7	3674.0
causes	16625.0	3726.7	3933.9	4747.3	7664.7	1761.0

syllabus, and hence has the rank shared by all the starred items in this study, 1746.5; the **weight** assigned to the New York Syllabus is 12 points, hence the **relative value** of *wind* in the New York Syllabus is the product of the **rank** of *wind* and the **weight** of the study, 1746.5 x 12 = 20958.0. (See Table VI.) To illustrate further, *wind* is one of 1761 topics in the complete list, which was not mentioned in the data from the Searle-Ruch study. Its rank in this study is therefore 881, which is the rank shared by all the 1761 unmentioned topics. The weight of the Searle-Ruch study is 8.7; hence, the **relative value** of *wind* in the Searle-Ruch study is 881 x 8.7 = 7664.7. Also, in the Pollock study, *wind* tied with another topic for the nineteenth and twentieth places from the top of the list of topics which received values in that study, and hence received the rank of 1831.5 in this study. Since the weight of the Pollock study is 5.8, the **relative value** of *wind* in the Pollock study is 1831.5 x 5.8 = 10622.7.

The relative value was computed in this way for every topic in every source.

Step VI. The Determination of the Aggregate Value of Each Topic

Table VI shows the relative values of certain topics in some of the sources, as computed in Step V. The sum of the relative values of any topic in all the sources composing any group became the **aggregate value** of that topic for that group. Thus the aggregate value of *wind* for Group A is the sum of the respective relative values of *wind* in the three syllabi composing Group A: 20958.0+10479.2+14893.1 = 46330.3. The aggregate values of every topic for each of the six groups of sources is given in Table VII (Chapter III).

The **final aggregate value** of any topic for the entire study is the sum of the aggregate values of that topic in the six groups of sources, and is therefore likewise the sum of the relative values of that topic in all 18 of the contributing sources.

Step VII. The Reduction of the Final Aggregate Values to Percentages of the Maximum Possible Value

The final aggregate values are not of a nature which makes them readily comparable. Even when the largest and the smallest of these values are known, the final aggregate values are not particularly con-

venient for the course maker or the textbook writer, because the scale of these values is neither a standard one nor a familiar one.

To make the results of this study more readily usable, therefore, the final aggregate value of each topic was reduced to the **percentage of the maximum possible value** which a topic might have if it not only appeared in every one of the eighteen contributing sources, but also if it had the highest rank in every one of these sources. Thus, the percentage of the maximum possible value was computed for each topic by dividing 100 times its final aggregate value by the product of the total number of topics (1850), and the sum of all the assigned weights of the respective sources (117.4). The formula for computing these values, stated algebraically, is:

Percentage of maximum possible value $= \frac{100v}{nw}$, when v equals the final aggregate value, n the total number of topics, and w the sum of the assigned weights of all the contributing sources.

Thus the percentage of maximum possible value for *air*, $\frac{100\ (201740.8)}{1850\ (117.4)}$ equals 92.9.

These percentages of the maximum possible value take the places of the final aggregate values in the last column of Table VII, where for convenience, they are called **Final Relative Values.** Their range is between 43.6 percent and 95.7 percent.

Chapter III

THE FINDINGS

The report of a synthetic curricular investigation of the type here attempted should present the data with a sufficient degree of completeness to serve the purposes of at least four groups of workers, the classroom teachers of the subject investigated, the individuals or committees engaged in the construction or revision of courses in the subject, the students of educational research in general, and those individuals actively engaged in curricular research in this field.

It should offer the first two of these groups two sorts of information: First, a list of subject-matter elements which includes every topic secured from all of the contributing sources; and secondly, a definite statement of the relative numerical values of all of these topics as determined from the statistical treatment of the data.

It should offer the last two of these groups of workers, first, a complete and detailed description of the research technique employed; and secondly, as much as it may be practicable to include of the data which were combined in securing the final results.

Table VII, which follows, supplements Chapter III in giving these various sorts of information. An inspection of Tables I and VI, however, indicates at once the impossibility of presenting within the space limitations of any book of ordinary size the complete findings of a study of this type. The complete data from all the successive steps of technique, if presented, moreover, would be so extensive and detailed as to destroy the practical value of the investigation to classroom teachers and course-makers, and to all but a very few students of educational research.

Table VII contains, therefore, only the data which seem likely to be desired by all who may wish to use the results of this study. Teachers of general science and those who are constructing or revising courses in the subject will probably find all the information they wish for their purposes in the first and last columns: The first column contains the entire list of 1850 topics found in the 18 contributing sources of data; the last column contains the final aggregate values, reduced to percentages for the sake of more ready comparison.

Students of educational research and active research investigators of the subject-matter of general science may find more or less useful the data given in the section of Table VII designated **Groups of Sources.** These columns present respectively the aggregate values derived from the six groups of contributing sources of data. They make possible a selection of aggregate values of certain groups of sources when those from all the groups are not desired; they further make possible a weighting of the aggregate values for the respective groups, in case another investigator should prefer a different emphasis upon the contributing groups in determining a new set of final aggregate values.

Since the last three digits, both in the aggregate values for groups and in the final aggregate values, are of no significance in comparing the aggregate values of the various topics, or in computing the percentages found in the last column, these digits are deleted in the table. Thus, for the first topic in Table VII, *air*, the aggregate value secured from the syllabi (Column A) is actually 46330.3, but is here given as 463; similarly, the aggregate value of *air* from the group of analyses of newspaper and magazine science is actually 28629.8, but is given in Column E as 286.

The small numbers which are used as subscripts of the aggregate values, and of the Final Relative Values indicate respectively the number of contributing sources in which the respective topics were found in each group, and the total number of sources in which the topic was found. Thus, the eighth topic in Table VII, *its composition, and properties of its constituents* was found in two of the syllabi, three of the textbook analyses, four of the interests studies, one of the newspaper and magazine analyses and none of the other groups of contributing sources, — ten studies altogether.

It was explained in Chapter II that the arrangement of the topics is that which was roughly determined by the New York syllabus, with the topics secured from the other contributing sources fitted into this syllabus at defensible points. Since the addition of these latter topics to the New York syllabus necessitated occasional rearrangements of items out of the order given in the New York syllabus, Table VII is intended merely to present in their original terminology a *list* of topics of general science, secured from various sources. It is not intended in any sense to present a logical outline of a course in general science, or to indicate the writer's idea of the order in which these topics should appear in such a course. This fact is at once apparent from the presentation of the major divisions of subject-matter topics in alphabetical order, which

leaves those who may wish to use these materials, free to arrange them in any way they please.

For the convenience of course makers and textbook writers, however, an elaborate index of topics is provided at the end of this volume.

It is obvious that Table VII cannot be expected to include all the topics which anybody might care to present in a course in general science. The list is unavoidably limited to just those topics which are found in the eighteen contributing sources. Doubtless there are other topics which are appropriate and desirable in a course in general science which do not appear in the findings, because none of the contributing sources revealed them.

The writer hopes and expects, therefore, that this investigation will merely serve as a starting point for future syntheses and evaluations of subject-matter content in general science; and that the results of this study will be re-examined and re-evaluated in the light of the findings of each subsequent curricular study in this field as it appears.

TABLE VII

The Values of the Topics by Groups of Sources, and the Final Relative Values of the Topics

TOPIC	Groups of Sources						Final Relative Value*
	A†	B	C	D	E	F	
AIR	463_3‡	444_4	690_6	286_2	98_1	36_1	92.9_{17}
its occurrence	309_1	200	327	168	45	18	49.1_1
above earth's surface	309_1	200	327	168	45	18	49.1_1
in water	309_1	200	327	168	45	18	49.1_1
in soil	309_1	200	327	168	45	18	49.1_1
extent of atmosphere	238_1	200	439_2	168	45	18	51.0_3
the ether	171	200	439_2	168	45	18	47.9_2
its composition, and properties of its constituents	377_2	384_3	586_4	248_1	45	18	76.3_{10}
gases	238_1	323_2	586_1	248_1	45	18	67.1_8
diffusion of gases	238_1	323_2	349_1	168	45	18	52.5_5
gas laws	171	253_1	327	168	45	18	45.2_1
a mixture of gases	309_1	200	327	168	45	18	49.1_1
water vapor	333_2	200	327	168	45	18	50.2_2
nitrogen	238_1	252_1	378_1	246_1	45	18	54.2_4
preparation and study	238_1	200	328	168	45	18	45.8_1
oxygen	333_2	296_2	382_1	246_1	45	18	60.7_6
presence and proportion of oxygen	333_2	200	327	168	45	18	50.2_2
occurrence	171	257_1	327	168	45	18	45.4_1
preparation	171	257_1	327	168	45	18	45.4_1
oxygen cycle	238_1	200	327	168	45	18	45.8_1
oxidation	361_2	296_2	350_1	168	45	18	57.0_5
physical and chemical changes	266_1	296_2	350_1	168	45	18	52.6_4
indestructibility of matter	266_1	200	327	168	45	18	47.1_1
use of oxygen in air in oxidation	361_2	250_1	327	168	45	18	53.8_3
rapid oxidation	294_1	200	327	168	45	18	48.4_1
slow oxidation	294_1	200	327	168	45	18	48.4_1
dangers of slow oxidation and their prevention	294_1	200	327	168	45	18	48.4_1
results of oxidation	294_1	200	327	168	45	18	48.4_1
products of oxidation	294_1	200	327	168	45	18	48.4_1
carbon dioxide	333_2	302_2	350_1	168	45	18	56.0_5
source	171	245_1	327	168	45	18	44.8_1
test for CO_2	333_2	200	327	168	45	18	50.2_2
role in nature	171	245_1	327	168	45	18	44.8_1
effervescence	171	200	350_1	168	45	18	43.8_1
fire extinguisher	171	245_1	327	168	45	18	44.8_1

* These Final Relative Values are expressed in percentages of the highest possible value which a topic might have if it received the highest rank in every one of the eighteen contributing sources.

† The letters A, B, C, D, E, F signify respectively Syllabi, Textbook Analyses, Interests Studies, Newspaper and Magazine Analyses, Harap Study and Cleveland Report.

‡ The subscripts indicate the number of sources in which each topic was found within each group; also, the total number of sources in which the topic was found. Thus *Air* was found in 3 syllabi, 4 textbook analyses, 6 interests studies, 2 newspaper and magazine analyses, in the Harap Study and the Cleveland Report, — 17 of the 18 sources.

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
AIR — Continued							
dust of the air	238_1	245_1	327	168	45	18	47.9_2
harmfulness	171	245_1	327	168	45	18	44.8_1
dead material	238_1	200	327	168	45	18	45.8_1
living material	238_1	200	327	168	45	18	45.8_1
microorganisms and red sunsets	238_1	200	327	168	45	18	45.8_1
air as a substance (physical properties)	238_1	275_1	350_1	168	45	18	50.3_3
occupies space	238_1	200	327	168	45	18	45.8_1
reflects light and holds heat	238_1	200	327	168	45	18	45.8_1
has weight	238_1	200	327	168	45	18	45.8_1
elasticity of air	238_1	200	350_1	168	45	18	46.9_2
liquid air	238_1	200	327	168	45	18	45.8_1
its relation to rusting of metals	333_2	200	381_1	168	45	18	52.7_2
its relation to burning substances	266_1	276_1	327	168	45	18	50.6_2
its relation to plants and animals	333_2	200	327	168	45	18	50.2_2
use of air to living things	377_2	351_3	327	251_1	45	18	63.0_6
oxidation in living things	377_2	200	327	168	45	18	52.2_2
living things as engines	266_1	200	327	168	45	18	47.1_1
respiration	333_3	351_3	327	251_1	45	18	61.0_6
breathing mechanism in human body	266_1	200	327	168	45	18	47.1_1
mechanics of respiration	171	241_1	327	251_1	45	18	48.4_2
artificial respiration: kinds and methods of administration	309_1	296_2	327	251_1	45	18	57.4_4
some general adaptations for breathing or using air in insect, fish, frog, and plant	333_2	200	327	168	45	18	50.2_2
causal relations between air, heat, oxidation, energy, work, and the tissues in the human body	309_1	200	327	168	45	18	49.1_1
relation of air to health	377_2	293_1	327	168	45	18	56.5_3
hygiene of breathing	377_2	245_1	327	168	45	18	54.3_3
effects of "bad" air on health	377_2	245_1	327	168	45	18	54.3_3
characteristics of "good" and "bad" air	377_2	245_1	327	168	45	18	54.3_3
air and its work	463_3	383_2	606_5	168	98_1	36_1	80.7_{13}
atmospheric pressure	377_2	251_1	349_1	168	45	36_1	56.4_5
uses of the barometer (aneroid and mercurial) and barograph	377_2	200	327	168	45	18	52.2_2
work of Galileo and Torricelli	266_1	200	327	168	45	18	47.1_1
some common uses of air	463_3	383_2	606_5	168	98_1	18	79.9_{12}
use of atmospheric pressure	463_3	257_1	583_4	168	98_1	18	73.0_9
in suction pump	377_2	256_1	327	168	45	18	54.8_3
in siphon	309_1	200	327	168	45	18	49.1_1
in medicine dropper	309_1	200	327	168	45	18	49.1_1
in non-skid tires	309_1	200	327	168	45	18	49.1_1
in drain-pipe pump	309_1	200	327	168	45	18	49.1_1
in vacuum cleaner	396_2	256_1	327	168	98_1	18	58.1_4
in balloon	309_1	200	327	168	45	18	49.1_1
in airplane	463_3	256_1	583_4	168	45	18	70.6_8
in sealing fruit jars	309_1	200	327	168	45	18	49.1_1
in breathing	309_1	200	327	168	45	18	49.1_1
uses of compressed air	420_3	383_2	606_5	168	98_1	18	77.9_{12}
mechanics of gases	420_3	383_2	606_5	168	98_1	18	77.9_{12}
Boyle's law	171	240_1	327	168	45	18	44.6_1
in air gun	333_2	200	327	168	45	18	50.2_2

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
AIR — Concluded							
in sand blast	333_2	200	327	168	45	18	50.2_2
in sprayer	266_1	200	327	168	45	18	47.1_1
in door check	266_1	200	327	168	45	18	47.1_1
in mail and cash tubes	333_2	200	327	168	45	18	50.2_2
in air brakes	333_2	200	327	168	45	18	50.2_2
in automobile tires	333_2	200	327	168	45	18	50.2_2
in force pump	266_1	256_1	327	168	45	18	49.7_2
in caisson (dangers)	333_2	200	327	168	45	18	50.2_2
in submarine	266_1	200	436_2	168	45	18	52.2_3
in floating of sunken ships	266_1	200	327	168	45	18	47.1_1
in mines	238_1	200	327	168	45	18	45.8_1
in air drills	238_1	200	327	168	45	18	45.8_1
in glass making processes	238_1	200	327	168	45	18	45.8_1
in invalid pillows and life belts	238_1	200	327	168	45	18	45.8_1
how balloons and airplanes travel in the air	257_1	200	327	168	45	18	46.7_1
man's successful attempt to imitate flight of birds	325_2	257_1	651_5	210_1	45	18	69.3_9
aeronautics	325_2	257_1	651_5	210_1	45	18	69.3_9
airplanes	325_2	257_1	583_4	168	45	18	64.2_7
Wright brothers	257_1	200	327	168	45	18	46.7_1
Zeppelin	257_1	200	327	168	45	18	46.7_1
Montgolfier brothers	257_1	200	327	168	45	18	46.7_1
Santos Dumont	257_1	200	327	168	45	18	46.7_1
Glen Curtis	257_1	200	327	168	45	18	46.7_1
service in wartime	238_1	200	327	168	45	18	45.8_1
construction and operation	238_1	200	327	168	45	18	45.8_1
training of an aviator	238_1	200	327	168	45	18	45.8_1
part played by aeronautics in World War	325_2	200	327	168	45	18	49.8_2
balloons	257_1	200	327	168	45	18	46.7_1
dirigibles	257_1	200	327	168	45	18	46.7_1
airplanes	325_2	200	327	168	45	18	49.8_2
hydroplanes	237_1	200	327	168	45	18	45.8_1
value of flying machines	257_1	200	327	168	45	18	46.7_1
Pulitzer races	237_1	200	327	168	45	18	45.8_1
altitude and speed records	237_1	200	327	168	45	18	45.8_1
U. S. Army and private flying enterprises	237_1	200	327	168	45	18	45.8_1
European airplane passenger service	237_1	200	327	168	45	18	45.8_1
ASTRONOMY	463_3	431_4	697_6	288_2	45	36_1	90.2_{16}
sky	171	200	522_3	168	45	18	51.7_3
light year	238_1	200	327	168	45	18	45.8_1
stars	420_3	328_2	547_3	168	45	35_1	71.0_9
in story and myth	305_2	200	327	168	45	18	48.9_2
universe	171	200	403_1	168	45	18	46.2_1
some stars and constellations	420_3	310_2	534_3	168	45	35_1	69.6_9
Pole star	352_2	200	327	168	45	18	51.1_2
Vega	266_1	200	327	168	45	18	47.1_1
Big Dipper	352_2	200	327	168	45	18	51.1_2
Orion	266_1	200	327	168	45	18	47.1_1
Milky Way	170	200	377_1	168	45	18	45.0_1
Cassiopeia	266_1	200	327	168	45	18	47.1_1
The Cross	266_1	200	327	168	45	18	47.1_1
Pleiades	266_1	200	327	168	45	18	47.1_1
Little Dipper	257_1	200	327	168	45	18	46.7_1

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
ASTRONOMY — Continued							
distances from sun and earth	333_2	200	327	168	45	18	50.2_2
size and color	333_2	200	327	168	45	18	50.2_2
our solar system	420_3	299_3	695_6	168	45	36_1	76.5_{12}
cosmic evolution	257_1	200	405_1	168	45	18	50.3_2
gravitational and centrifugal forces in our solar system	283_2	302_3	686_6	252_1	45	18	73.0_{11}
work of Galileo	283_2	200	327	168	45	18	47.9_2
work of Newton	283_2	200	327	168	45	18	47.9_2
gravity defined	238_1	302_3	686_6	252_1	45	18	70.9_{10}
weight	238_1	200	350_1	168	45	18	46.9_2
the sun	420_3	255_1	671_5	168	45	18	72.6_9
sun a smaller star	238_1	200	327	168	45	18	45.8_1
changing positions of sun	238_1	200	327	168	45	18	45.8_1
source of our light and heat	238_1	200	327	168	45	18	45.8_1
distance from earth	325_2	200	327	168	45	18	49.8_2
diameter, volume, mass	238_1	200	327	168	45	18	45.8_1
source of *its* light and heat	238_1	200	327	168	45	18	45.8_1
material of its composition as revealed by spectroscope	238_1	200	327	168	45	18	45.8_1
period of rotation revealed by sun spots	238_1	200	327	168	45	18	45.8_1
the earth	420_3	254_2	670_5	168	45	18	72.5_{11}
earth's magnetism	238_1	302_3	521_4	252_1	45	18	63.3_8
magnetic compass	238_1	200	521_4	168	45	18	54.7_5
history and use	238_1	200	327	168	45	18	45.8_1
location of magnetic poles	238_1	200	327	168	45	18	45.8_1
ways of determining directions without compass	238_1	200	327	168	45	18	45.8_1
form of earth	238_1	200	327	168	45	18	45.8_1
primitive ideas of its form	238_1	200	327	168	45	18	45.8_1
proofs that it is spherical	238_1	200	327	168	45	18	45.8_1
horizon	171	200	387_1	168	45	18	45.5_1
earth's measurements	420_3	341_3	435_2	168	45	18	66.2_8
latitude and longitude	266_1	340_3	377_1	168	45	18	55.9_5
meaning of latitude	238_1	200	327	168	45	18	45.8_1
meaning of longitude	238_1	200	327	168	45	18	45.8_1
reasons for location of great circles	238_1	200	327	168	45	18	45.8_1
location at sea	171	200	385_1	168	45	18	45.4_1
movements of earth	463_3	356_2	569_4	168	45	18	74.5_{10}
rotation period, results	238_1	242_1	385_1	168	45	18	50.4_3
the seasons	463_3	356_2	566_4	168	45	18	74.4_{10}
inclination of axis of earth	238_1	200	327	168	45	18	45.8_1
change of season	238_1	200	327	168	45	18	45.8_1
cause	325_2	200	327	168	45	18	49.8_2
boundaries of zones	238_1	200	327	168	45	18	45.8_1
latitude and season	238_1	200	327	168	45	18	45.8_1
seasonal variation dependent upon distance from equator	238_1	200	327	168	45	18	45.8_1
varying length of day and night	238_1	200	327	168	45	18	45.8_1
economic results	238_1	200	327	168	45	18	45.8_1
places affected	238_1	200	327	168	45	18	45.8_1
effects upon plants, animals and people	463_3	200	327	168	45	18	56.2_3
time	420_3	290_2	327	168	45	18	58.4_5
standard time zones	333_2	242_1	327	168	45	18	52.2_3

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
ASTRONOMY — Concluded							
longitude and time	238_1	200	327	168	45	18	45.8_1
Prime Meridian	238_1	200	327	168	45	18	45.8_1
international date line	238_1	200	327	168	45	18	45.8_1
daylight saving	305_2	200	327	168	45	18	48.9_2
history of movement	238_1	200	327	168	45	18	45.8_1
what it means	238_1	200	327	168	45	18	45.8_1
advantages and disadvantages	238_1	200	327	168	45	18	45.8_1
the moon	420_3	249_1	672_5	209_1	45	18	74.2_{10}
size	238_1	200	327	168	45	18	45.8_1
appearance	238_1	200	327	168	45	18	45.8_1
source of its light	238_1	200	327	168	45	18	45.8_1
comparison of conditions on sun, earth and moon	333_2	200	327	168	45	18	50.2_2
orbits	333_2	200	327	168	45	18	50.2_2
motions and effects	420_3	249_1	650_5	168	45	18	71.3_9
moon phases	400_3	200	327	168	45	18	53.3_3
eclipses	237_1	249_1	580_4	168	45	18	59.7_6
tides	171	244_1	650_5	168	45	18	59.6_6
waves	171	200	389_1	209_1	45	18	47.4_2
planets other than the earth	420_3	255_1	670_5	168	45	18	72.6_9
meaning of word "planet"	238_1	200	327	168	45	18	45.8_1
how planets were named	333_2	200	327	168	45	18	50.2_2
Mars	420_3	255_1	664_5	168	45	18	72.3_9
the other planets	420_3	255_1	670_5	168	45	18	72.5_9
study of each	420_3	200	327	168	45	18	54.2_3
distance from earth	333_2	200	327	168	45	18	50.2_2
size compared with earth	333_2	200	327	168	45	18	50.2_2
length of day and year	238_1	200	327	168	45	18	45.8_1
composition	333_2	200	327	168	45	18	50.2_2
evidences of atmosphere	238_1	200	327	168	45	18	45.8_1
amount of light and heat	238_1	200	327	168	45	18	45.8_1
number, size and rotation of satellites	238_1	200	327	168	45	18	45.8_1
distinguishing and interesting features	238_1	200	327	168	45	18	45.8_1
distances from sun	266_1	200	327	168	45	18	47.1_1
planetoids	238_1	200	327	168	45	18	45.8_1
meteors	257_1	243_1	623_5	168	45	18	62.3_7
comets	325_2	243_1	577_4	168	45	18	63.3_7
nature, composition, and behavior	238_1	200	327	168	45	18	45.8_1
ancient beliefs concerning	238_1	200	327	168	45	18	45.8_1
number and periods of reappearance	238_1	200	327	168	45	18	45.8_1
Halley's comet	238_1	200	327	168	45	18	45.8_1
BUILDING MATERIALS	420_3	301_2	505_3	168	98_1	18	69.5_9
men's houses from earliest times	257_1	200	327	168	45	18	46.7_1
variations in different zones	257_1	200	327	168	45	18	46.7_1
kinds of building materials	257_1	250_1	327	168	45	18	48.7_2
durability	257_1	200	327	168	45	18	46.7_1
strength	257_1	200	327	168	45	18	46.7_1
weight	257_1	200	327	168	45	18	46.7_1
wearing quality	257_1	200	327	168	45	18	46.7_1
transparency	257_1	200	327	168	45	18	46.7_1
fireproofness and waterproofness	171	250_1	327	168	45	18	45.0_1
wood as a building material	257_1	200	327	168	98_1	18	49.2_2
preparation	257_1	200	327	168	45	18	46.7_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
BUILDING MATERIALS — Concluded							
choosing lumber	171	200	327	168	98_1	18	45.2_1
common woods and appropriate uses	171	200	327	168	98_1	18	45.2_1
relative durability	171	200	327	168	98_1	18	45.2_1
Douglas fir	171	200	327	168	98_1	18	45.2_1
yellow pine	171	200	327	168	98_1	18	45.2_1
western yellow pine	171	200	327	168	98_1	18	45.2_1
hemlock	171	200	327	168	98_1	18	45.2_1
spruce	171	200	327	168	98_1	18	45.2_1
cypress	171	200	327	168	98_1	18	45.2_1
redwood	171	200	327	168	98_1	18	45.2_1
birch and mahogany	171	200	327	168	98_1	18	45.2_1
gumwood and walnut	171	200	327	168	98_1	18	45.2_1
veneer	171	200	327	168	98_1	18	45.2_1
imitation veneer	171	200	327	168	98_1	18	45.2_1
suitable woods for different parts of house	171	200	327	168	98_1	18	45.2_1
hardwoods *vs.* softwoods	171	200	327	168	98_1	18	45.2_1
building stone	420_2	257_1	442_2	168	46	18	62.1_6
how obtained	257_1	200	327	168	46	18	46.7_1
types used and reasons for selection	266_1	200	327	168	46	18	47.1_1
slate	171	200	381_1	168	46	18	45.2_1
clay	257_1	243_1	327	168	46	18	48.7_2
cement	257_1	243_1	442_2	168	46	18	54.0_4
lime	257_1	243_1	327	168	98_1	18	51.1_3
its uses	176	200	327	168	98_1	18	45.2_1
glass	257_1	243_1	505_2	168	98_1	18	59.3_6
its manufacture	257_1	243_1	327	168	98_1	18	51.1_3
window and plate glass	171	200	327	168	98_1	18	45.2_1
plaster of Paris	237_1	200	327	168	45	18	45.8_1
asbestos	237_1	200	377_1	168	45	18	48.1_2
aluminum	237_1	200	389_1	168	45	18	48.6_2
brass and bronze as house fittings	171	200	327	168	98_1	18	45.2_1
preservatives	237_1	244_1	383_1	168	98_1	18	52.8_4
paints and oils	171	244_1	383_1	168	98_1	18	49.8_3
stains and varnishes	171	200	327	168	98_1	18	45.2_1
enamel	171	200	327	168	98_1	18	45.2_1
linseed oil	171	200	327	168	98_1	18	45.2_1
four white pigments	171	200	327	168	98_1	18	45.2_1
thinners — turpentine and benzol	171	200	327	168	98_1	18	45.2_1
lead and manganese driers	171	200	327	168	98_1	18	45.2_1
illuminating quality of common interior colors	171	200	327	168	98_1	18	45.2_1
mixing colors	171	200	327	168	98_1	18	45.2_1
cleaning paint brushes	171	200	327	168	98_1	18	45.2_1
dangers of chemicals in paint and varnish	171	200	327	168	98_1	18	45.2_1
preparation of whitewash and calcimine	171	200	327	168	98_1	18	45.2_1
CLOTHING	325_2	300_2	457_2	168	98_1	18	62.8_7
primitive clothing	257_1	200	327	168	45	18	46.7_1
sources	325_2	247_1	437	168	98_1	18	59.5_6
leather	171	200	387_1	168	98_1	18	47.9_2
wool	237_1	200	437_2	168	45	18	50.9_3
from sheep to suit of clothes	237_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
CLOTHING — Concluded							
silk	237_1	200	436_2	168	45	18	50.8_3
my silk dress	237_1	200	327	168	45	18	45.8_1
weighted silk	171	200	327	168	98_1	18	45.2_1
linen	171	200	327	168	98_1	18	45.2_1
special characteristics of linen	171	200	327	168	98_1	18	45.2_1
laundering properties	171	200	327	168	98_1	18	45.2_1
effect of dye on linen	171	200	327	168	98_1	18	45.2_1
uses of linen	171	200	327	168	98_1	18	45.2_1
sizing of linen	171	200	327	168	98_1	18	45.2_1
cotton	325_2	200	327	168	98_1	18	52.3_3
"filled" and mercerized cotton	171	200	327	168	98_1	18	45.2_1
furs	171	200	327	168	98_1	18	45.2_1
recognition of kinds and values	171	200	327	168	98_1	18	45.2_1
choice of materials in different climates and seasons	325_2	200	327	168	98_1	18	52.3_3
to maintain even temperature	325_2	200	327	168	98_1	18	52.3_3
tests for different materials	325_2	200	327	168	45	18	49.8_2
characteristics of different materials	257_1	200	327	168	98_1	18	49.2_2
relative capacities of fabrics to absorb and evaporate moisture	171	200	327	168	98_1	18	45.2_1
cleaning and care of clothing	325_2	300_2	457_2	168	98_1	18	62.8_7
special devices for conserving	171	200	327	168	98_1	18	45.2_1
laundering	257_1	200	327	168	98_1	18	49.2_2
removal of stains	171	271_1	457_2	168	98_1	18	54.4_4
removal of grease	257_1	200	327	168	98_1	18	49.2_2
common grease solvents	171	200	327	168	98_1	18	45.2_1
benzol, alcohol, turpentine, benzine	171	200	327	168	98_1	18	45.2_1
gasoline, chloroform	171	200	327	168	98_1	18	45.2_1
carbon tetrachloride	171	200	327	168	98_1	18	45.2_1
inflammability	171	200	327	168	98_1	18	45.2_1
removal of ink	257_1	200	327	168	98_1	18	49.2_2
removal of food	257_1	200	327	168	98_1	18	49.2_2
removal of paint	257_1	200	327	168	98_1	18	49.2_2
dry cleaning	257_1	200	327	168	98_1	18	49.2_2
pressing	257_1	200	327	168	98_1	18	49.2_2
protection from moths	238_1	200	327	168	98_1	18	48.3_2
effect of soap on different fabrics	171	200	327	168	98_1	18	45.2_1
effect of temperature on different fabrics	171	200	327	168	98_1	18	45.2_1
effect of living organisms on clothing	171	200	327	168	98_1	18	45.2_1
effect of weather on clothing	171	200	327	168	98_1	18	45.2_1
storing of clothing	171	200	327	168	98_1	18	45.2_1
effect of artificial light on color of fabrics	171	200	327	168	98_1	18	45.2_1
manufacture of clothing	257_1	200	379_1	168	98_1	18	51.5_2
making rubber boots	237_1	200	327	168	98_1	18	48.2_2
effects of sunshine, heat and oil on rubber	171	200	327	168	98_1	18	45.2_1
making a leather shoe	237_1	200	327	168	98_1	18	48.2_2
technical names of parts	171	200	327	168	98_1	18	45.2_1
parts and quality	171	200	327	168	98_1	18	45.2_1
cost and comfort	171	200	327	168	98_1	18	45.2_1
leathers — merits and cost	171	200	327	168	98_1	18	45.2_1
fitting properly	171	200	327	168	98_1	18	45.2_1
structure of foot and relation of shoe	171	200	327	168	98_1	18	45.2_1
high heels and tight shoes *vs.* health	171	200	327	168	98_1	18	45.2_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
CRUST OF THE EARTH	333_2	374_3	665_5	272_1	98_1	37_1	81.9_{13}
rocks	333_2	251_1	439_2	209_1	45	36_1	60.5_7
formation of rocks	333_2	251_1	439_2	209_1	45	18	59.6_6
by water sediments	333_2	251_1	327	168	45	18	52.6_2
kinds of sedimentary rocks	266_1	251_1	327	168	45	18	49.5_2
some uses of sedimentary rocks	266_1	200	327	168	45	18	47.1_1
petrifying	171	200	439_2	168	45	18	47.9_2
fossils and their significance	266_1	200	327	209_1	45	18	49.0_2
by action of heat	333_2	251_1	327	168	45	18	52.6_2
kinds of igneous rocks	333_2	251_1	327	168	45	18	52.6_2
metamorphic	238_1	200	327	168	45	18	45.8_1
characteristics of each kind of rock	266_1	200	327	168	45	18	47.1_1
soil	333_2	366_2	438_2	247_1	98_1	38_1	69.9_{10}
formation of soil	333_2	366_2	437_2	168	45	36_1	63.8_8
weathering	333_2	356_3	437_2	168	45	36_1	63.3_8
by water erosion	333_2	356_3	327	168	45	18	57.4_5
by wind erosion	333_2	200	327	168	45	18	50.2_2
by glaciers	333_2	339_3	437_2	168	45	18	61.7_7
by icebergs	171	245_1	327	168	45	18	44.8_1
by frost and ice	333_2	200	327	168	45	18	50.2_2
by plants and animals	333_2	200	327	168	45	18	50.2_2
by other agencies	333_2	200	327	168	45	18	50.2_2
composition and structure of soil	333_2	250_1	381_1	168	45	18	55.0_4
mineral elements	171	200	381_1	168	45	18	45.2_1
organic elements	238_1	200	327	168	45	18	45.8_1
water-holding capacity	238_1	200	327	168	45	18	45.8_1
water table	238_1	200	327	168	45	18	45.8_1
kinds of soil	333_2	258_1	391_1	247_1	45	18	59.4_5
sand, clay, loam	266_1	200	327	168	45	18	47.1_1
properties	266_1	200	327	168	45	18	47.1_1
importance to plant growth	333_2	200	327	168	45	18	50.2_2
lava soils in Idaho and Oregon	238_1	200	327	168	45	18	45.8_1
acid soil	171	200	385_1	168	45	18	45.4_1
lime	171	200	385_1	168	45	18	45.4_1
conservation and improvement of soils	333_2	346_3	438_2	168	98_1	36_1	65.4_9
fertilization	333_2	346_3	438_2	168	45	36_1	62.9_8
fertilizers	333_2	346_3	438_2	168	45	36_1	62.9_8
potash	171	200	376_1	168	45	18	45.0_1
tillage	333_2	247_1	327	168	45	36_1	53.2_4
life in the soil	266_1	200	327	168	45	18	47.1_1
kinds	266_1	200	327	168	45	18	47.1_1
relation to growth of plants	266_1	200	327	168	45	18	47.1_1
importance of conservation and control	266_1	200	327	168	45	18	47.1_1
formation of earth's crust	238_1	339_3	665_5	209_1	45	18	69.7_{10}
sea (oceans)	171	255_1	657_5	168	45	18	60.4_6
mountains	171	244_1	381_1	168	45	18	47.2_2
land forms, coast lines, bays, etc.	171	243_1	327	168	45	18	44.7_1
topographical maps	171	241_1	327	168	45	18	44.6_1
underground forces	238_1	285_2	665_5	209_1	45	18	67.2_6
increase of temperature with depth	238_1	200	327	168	45	18	45.8_1
probable nature of earth's interior	238_1	200	327	168	45	18	45.8_1
relative thickness and position of the solid and mantle rocks	238_1	200	327	168	45	18	45.8_1
earthquakes	238_1	285_2	602_4	209_1	45	18	64.3_6
volcanoes	238_1	285_2	665_5	209_1	45	18	67.2_9

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
CRUST OF THE EARTH — Continued							
geysers	238_1	200	582_4	168	45	18	57.6_5
relation of mountain areas to water power and of plains to farms	266_1	200	327	168	45	18	47.1_1
earth a store house of valuable materials	238_1	374_2	577_4	272_1	98_1	18	72.5_{10}
building stone	420_3	257_1	327	168	45	18	56.8_4
useful metals	238_1	374_3	577_4	272_1	98_1	18	72.5_{10}
metallurgy	171	250_1	327	168	45	18	45.0_1
mines — their construction	171	241_1	327	168	45	18	44.6_1
mining	237_1	241_1	327	168	45	18	47.7_2
stamp mills	237_1	200	327	168	45	18	45.8_1
placer mining	237_1	200	327	168	45	18	45.8_1
flotation process	237_1	200	327	168	45	18	45.8_1
smelting	237_1	200	327	168	45	18	45.8_1
physical properties	238_1	200	327	168	45	18	45.8_1
malleability	238_1	200	327	168	45	18	45.8_1
ductility	238_1	200	327	168	45	18	45.8_1
fusibility	238_1	200	327	168	45	18	45.8_1
conductivity	238_1	200	327	168	45	18	45.8_1
luster	238_1	200	327	168	45	18	45.8_1
ores	238_1	200	327	168	45	18	45.8_1
alloys	238_1	243_1	327	168	45	18	47.8_2
amalgams	238_1	200	327	168	45	18	45.8_1
iron	238_1	269_1	450_2	168	98_1	18	57.1_5
the Iron Age	238_1	200	327	168	45	18	45.8_1
steel	171	269_1	384_1	168	98_1	18	50.9_3
distribution of iron ore in U. S., Europe, etc.	238_1	200	327	168	45	18	45.8_1
iron ores and methods of mining	238_1	200	327	168	45	18	45.8_1
reduction of ore	238_1	200	327	168	45	18	45.8_1
open hearth method	238_1	200	327	168	45	18	45.8_1
Bessemer process	238_1	200	327	168	45	18	45.8_1
details and advantages of both	238_1	200	327	168	45	18	45.8_1
metal for tools	171	200	327	168	98_1	18	45.2_1
cast iron	171	200	327	168	98_1	18	45.2_1
malleable cast iron	171	200	327	168	98_1	18	45.2_1
steel	171	200	327	168	98_1	18	45.2_1
relative durabilities	171	200	327	168	98_1	18	45.2_1
copper	238_1	200	443_2	168	45	18	51.2_3
method of reduction	238_1	200	327	168	45	18	45.8_1
occurrence and distribution	238_1	200	327	168	45	18	45.8_1
copper and the electrical industries	238_1	200	327	168	45	18	45.8_1
other industrial uses	238_1	200	327	168	45	18	45.8_1
silver	238_1	200	382_1	168	45	18	48.5_2
gold	238_1	200	568_4	168	45	18	56.9_5
lead, tungsten	238_1	200	327	168	45	18	45.8_1
distribution in U. S.	238_1	200	327	168	45	18	45.8_1
uses of each	238_1	200	327	168	45	18	45.8_1
aluminum	171	200	389_1	168	45	18	45.6_1
platinum	171	200	376_1	168	45	18	45.0_1
tin	171	200	387_1	168	45	18	45.5_1
sodium	171	200	327	248_1	45	18	46.4_1
radium	171	200	577_4	272_1	45	18	59.0_5
mercury	171	251_1	442_2	168	45	18	50.4_3
minerals	305_2	318_2	592_4	168	45	18	66.5_8

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
CRUST OF THE EARTH — Concluded							
sulphur	171	244_1	327	168	45	18	44.8_1
chalk	171	200	489_3	168	45	18	50.2_3
crude-oil	305_2	318_2	592_4	168	45	18	66.5_8
gasoline	237_1	200	525_3	168	45	18	54.9_4
pottery and glass-making materials	325_2	200	327	168	45	18	49.8_2
ELECTRICITY AND MAGNETISM	420_3	435_4	697_8	293_2	98_1	37_1	91.1_{17}
magnets	237_1	255_1	350_1	168	45	18	49.4_3
permanent magnets	171	255_1	327	168	45	18	45.3_1
early discoveries in electricity	325_2	200	327	168	45	18	49.8_2
static or frictional	238_1	251_1	410_2	248_1	45	18	55.6_5
Aurora borealis	171	241_1	584_4	168	45	18	56.4_4
current	257_1	200	350_1	247_1	45	36_1	52.2_4
alternating and direct	257_1	200	327	168	45	18	46.7_1
advantage of alternating	257_1	200	327	168	45	18	46.7_1
conduction	257_1	200	416_2	168	45	18	50.8_3
conductors and insulators	257_1	200	327	168	45	18	46.7_1
resistance	171	200	350_1	168	45	36_1	44.6_2
magnetism and electricity	257_1	272_1	350_1	247_1	45	36_1	55.5_6
induction	171	200	327	247_1	45	18	46.4_1
electro-magnets and applications	257_1	254_1	350_1	168	45	36_1	51.0_4
sources of electricity	420_3	372_3	476_2	251_1	98_1	36_1	76.1_{13}
cells	325_2	301_2	416_2	168	45	36_1	59.4_7
large and small cells	305_2	301_2	327	168	45	18	53.5_4
Edison cells	305_2	200	327	168	45	18	48.9_2
series and parallel connection of cells	238_1	200	327	168	45	36_1	46.7_2
dynamo	333_2	252_1	327	251_1	98_1	18	58.9_5
parts and operation of dynamo	238_1	200	327	168	45	18	45.8_1
mechanical energy transformed to electrical by dynamo	238_1	200	327	168	98_1	18	48.3_2
motor	237_1	252_1	387_1	168	45	18	51.0_3
practical uses of electricity in home	420_3	295_2	350_1	168	98_1	18	62.0_7
availability of electric service	257_1	200	327	168	45	18	46.7_1
advantages of electric power, heat and light	257_1	200	327	168	45	18	46.7_1
wiring	333_2	243_1	350_1	168	98_1	18	55.6_5
sockets	171	200	327	168	98_1	18	45.2_1
plugs	171	200	327	168	98_1	18	45.2_1
switches	171	243_1	327	168	45	18	44.7_1
complete circuits	171	200	350_1	168	45	18	43.8_1
grounded circuits	171	200	350_1	168	45	18	43.8_1
short circuits and fuses	333_2	243_1	350_1	168	98_1	18	55.6_5
proper use of fuses	171	200	327	168	98_1	18	45.2_1
overloading wires	171	200	327	168	98_1	18	45.2_1
electric door bell	257_1	244_1	327	168	98_1	18	51.2_3
installation	171	200	327	168	98_1	18	45.2_1
buzzer	325_2	200	327	168	45	18	49.8_2
lamps	420_3	251_1	327	168	98_1	18	59.0_5
economy and advantage of new articles of electrical equipment for home	171	200	327	168	98_1	18	45.2_1
electric motor for household purposes	171	200	327	168	98_1	18	45.2_1
vacuum cleaner	257_1	243_1	327	168	98_1	18	51.1_3
current consumption	171	200	327	168	98_1	18	45.2_1
electric sewing machine	257_1	243_1	327	168	45	18	48.7_2
electric washer	257_1	243_1	327	168	45	18	48.7_2

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
ELECTRICITY, ETC. — Concluded							
units of electrical measure	257_1	245_1	327	168	98_1	18	51.2_3
watt, volt, ampere	171	200	327	168	98_1	18	45.2_1
electric meter in home	257_1	200	381_1	168	98_1	18	51.6_3
ammeter and voltmeter	257_1	200	327	168	45	18	46.7_1
reading of meter	238_1	200	381_1	168	98_1	18	50.7_3
testing of meter	171	200	327	168	98_1	18	45.2_1
calculation of current used	171	200	327	168	98_1	18	45.2_1
transformer	257_1	243_1	327	168	45	18	48.7_2
electric automobile	237_1	200	327	168	45	18	45.8_1
electricity in autos	257_1	244_1	390_1	168	98_1	18	54.1_4
for lighting purposes	257_1	200	327	168	98_1	18	49.2_2
automobile generator	237_1	200	327	168	45	18	45.8_1
automobile starter	237_1	200	327	168	45	18	45.8_1
care of generators and motors	257_1	200	327	168	45	18	46.7_1
care of automobile batteries	237_1	244_1	390_1	168	45	18	50.7_3
electric car	237_1	200	327	168	45	18	45.8_1
electric arc	171	200	327	168	98_1	18	45.2_1
electrotyping and plating	237_1	250_1	327	168	45	18	48.1_2
electric shock and burns	171	200	327	168	98_1	18	45.2_1
work of Faraday	266_1	200	327	168	45	18	47.1_1
work of Edison	266_1	200	327	168	45	18	47.1_1
work of Steinmetz	266_1	200	327	168	45	18	47.1_1
how messages are sent by electricity	325_2	301_2	674_5	210_1	45	18	72.4_{10}
Morse and Bell inventions	257_1	200	327	168	45	18	46.7_1
telegraph	257_1	244_1	383_1	168	45	18	51.3_3
telegraph receiving set	237_1	200	327	168	45	18	45.8_1
telephone	325_2	301_2	383_1	168	45	18	57.1_5
spread of use of telephone and telegraph	257_1	200	327	168	45	18	46.7_1
Marconi and wireless	257_1	200	327	168	45	18	46.7_1
radio	325_2	255_1	634_5	210_1	45	18	68.4_9
broadcasting	257_1	200	327	168	45	18	46.7_1
wireless receiving set	257_1	200	327	168	45	18	46.7_1
coil and crystal detector	237_1	200	327	168	45	18	45.8_1
vacuum tube receiving set	237_1	200	327	168	45	18	45.8_1
induction coil	237_1	200	327	168	45	18	45.8_1
X-ray	171	200	393_1	168	45	18	45.7_1
ENVIRONMENT	309_1	249_1	327	168	45	18	51.4_2
nature of our environment	309_1	200	327	168	45	18	49.1_1
chief factors or conditions of	266_1	200	327	168	45	18	47.1_1
relative values of air, water, heat, light, soil to living things	266_1	200	327	168	45	18	47.1_1
some ways in which environment affects living things	266_1	200	327	168	45	18	47.1_1
man's natural and artificial environment	266_1	200	327	168	45	18	47.1_1
our environment as the source of our knowledge	309_1	249_1	327	168	45	18	51.4_2
use of special senses in obtaining knowledge	266_1	200	327	168	45	18	47.1_1
relation between knowledge and superstition	266_1	200	327	168	45	18	47.1_1
relation between knowledge and experiment	266_1	200	327	168	45	18	47.1_1
relation between experiment and science	266_1	200	327	168	45	18	47.1_1
meaning and importance of an experiment	309_1	249_1	327	168	45	18	51.4_2
factors involved	309_1	200	327	168	45	18	49.1_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
ENVIRONMENT — Concluded							
stating the problem	309_1	200	327	168	45	18	49.1_1
securing the materials	309_1	200	327	168	45	18	49.1_1
use of materials to produce a natural result	309_1	200	327	168	45	18	49.1_1
observation of the results	309_1	200	327	168	45	18	49.1_1
conclusion drawn	309_1	200	327	168	45	18	49.1_1
practical application of conclusion to solution of new problems	309_1	200	327	168	45	18	49.1_1
repeated reference to value and use of an experiment	309_1	249_1	327	168	45	18	51.4_2
value of control experiment	266_1	200	327	168	45	18	47.1_1
meaning and importance of science today	266_1	249_1	327	168	45	18	49.4_2
some scientists and their work	266_1	200	327	168	45	18	47.1_1
how one may become a scientist	266_1	200	327	168	45	18	47.1_1
method of science study	171	249_1	327	168	45	18	45.0_1
FIRE	463_3	433_4	679_6	219_1	98_1	37_1	88.8_{16}
discovery and worship	266_1	200	327	168	45	18	47.1_1
superstitions concerning	266_1	200	327	168	45	18	47.1_1
relation of use of fire to advances in civilization	266_1	200	327	168	45	18	47.1_1
uses to man	420_3	200	327	168	45	18	54.2_3
warmth	333_2	200	327	168	45	18	50.2_2
preparation of food	352_2	200	327	168	45	18	51.1_2
heating liquids	266_1	200	327	168	45	18	47.1_1
melting metals	266_1	200	327	168	45	18	47.1_1
early method of starting fire	257_1	200	327	168	45	18	46.7_1
friction (rotating wood)	257_1	200	327	168	45	18	46.7_1
friction (flint and steel)	257_1	200	327	168	45	18	46.7_1
matches	257_1	253_1	439_2	168	45	18	54.3_4
discovery of	257_1	200	327	168	45	18	46.7_1
manufacture of	237_1	251_1	327	168	45	18	48.2_2
phosphorus matches	171	251_1	327	168	45	18	45.1_1
Davy safety match	237_1	200	327	168	45	18	45.8_1
proper way to start a campfire	257_1	200	327	168	45	18	46.7_1
combustion	463_3	317_3	522_3	168	45	18	70.6_8
conditions for combustion and its products	377_2	260_1	327	168	45	18	55.0_3
relation of air and temperature to combustion	463_3	200	327	168	45	18	56.2_3
kindling temperatures	420_3	200	327	168	45	18	54.2_3
common combustion products	352_2	200	522_3	168	45	18	60.1_5
smoke	171	200	522_3	168	45	18	51.7_3
CO_2 in relation to burning	238_1	200	327	168	45	18	45.8_1
some common non-combustible substances	352_2	200	377_1	168	45	18	53.4_3
asbestos	171	200	377_1	168	45	18	45.0_1
fuels and carbon compounds	420_3	428_4	577_4	168	98_1	37_1	79.5_{13}
fuels of primitive man	325_2	200	327	168	45	18	49.8_2
fuels a factor in human progress	238_1	200	327	168	45	18	45.8_1
carbon cycle	238_1	360_3	327	168	45	18	53.2_4
common fuels	448_3	331_2	327	168	45	37_1	62.4_8
kinds and origin	380_2	200	327	168	45	18	52.4_2
chemical nature of	171	247_1	327	168	45	18	44.9_1
carbon and hydrogen as important fuel elements	448_3	250_1	327	168	45	18	57.8_4
solid fuels	325_2	380_3	574_4	168	98_1	18	71.9_{10}

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
FIRE — Concluded							
charcoal	171	240_1	376_1	168	45	18	46.8_2
absorption of gases	171	240_1	327	168	45	18	44.6_1
wood	325_2	200	327	168	45	18	49.8_3
coal	325_2	308_2	574_4	168	45	18	66.2_8
formation	237_1	308_2	520_3	168	45	18	59.6_6
distribution	325_2	255_1	327	168	45	18	52.4_3
yearly production in U. S.	257_1	200	327	168	45	18	46.7_1
coke	238_1	200	327	168	45	18	45.8_1
liquid fuels	325_2	318_2	381_1	168	45	18	57.7_5
petroleum	325_2	318_2	381_1	168	45	18	57.7_5
production	171	247_1	327	168	45	18	44.9_1
alcohol	305_2	200	376_1	168	45	18	51.1_3
gas	325_2	318_2	408_2	168	45	37_1	59.8_7
natural	171	247_1	350_1	168	45	18	45.9_2
coal gas	171	200	350_1	168	45	18	43.8_1
acetylene	171	200	350_1	168	45	18	43.8_1
proper mixture of air with gaseous fuels — control in gas range	266_1	200	327	168	98_1	18	49.6_2
relative heat values of common fuels	448_3	200	327	168	98_1	18	57.9_4
relative cost of fuels for cooking and heating	238_1	200	381_1	168	98_1	18	50.7_3
how to read gas meters	238_1	200	381_1	168	98_1	18	50.7_3
testing gas meters	171	200	327	168	98_1	18	45.2_1
some present day and future fuel problems	333_2	200	327	168	98_1	18	52.7_3
waste of fuel in overheated buildings	238_1	200	327	168	45	18	45.8_1
conservation of fuels	238_1	200	327	168	98_1	18	48.3_2
amount and distribution of each kind	238_1	200	327	168	45	18	45.8_1
rates of present consumption	238_1	200	327	168	45	18	45.8_1
modern inventions which increase rate of consumption	238_1	200	327	168	45	18	45.8_1
wasteful methods of lumbering, mining and oil refining	238_1	200	327	168	45	18	45.8_1
ways and means of conservation in home, community and industry	238_1	200	327	168	98_1	18	48.3_2
smoke consumers	238_1	200	327	168	45	18	45.8_1
fire dangers and losses	463_3	301_2	457_3	219_1	98_1	18	71.6_{10}
fire hazards in homes, schools and other public buildings	396_2	200	327	168	45	18	53.1_2
fire exits	377_2	200	327	168	45	18	52.2_2
fire drills	377_2	200	327	168	45	18	52.2_2
first aid to fire victims	377_2	301_2	327	168	98_1	18	59.3_5
extinguishing fire in burning clothing	377_2	301_2	327	168	98_1	18	59.3_5
treatment of burns	377_2	301_2	327	168	98_1	18	59.3_5
blankets, sand, water, earth, as fire extinguishers	171	200	327	168	98_1	18	45.2_1
explosions	237_1	244_1	457_3	168	98_1	18	56.2_6
asphyxiation	171	200	327	168	98_1	18	45.2_1
fire prevention	463_3	200	327	168	98_1	18	58.6_4
care and use of fire extinguisher	463_3	200	327	168	98_1	18	58.6_4
fire prevention measures which all should use at home and in the street	463_3	200	327	168	45	18	56.2_3
sprinkler systems	238_1	200	327	168	45	18	45.8_1
fire engines	237_1	200	327	168	45	18	45.8_1
modern stokers in school buildings	237_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
FOOD	463_3	441_4	604_8	306_2	98_1	18	88.8_{15}
how man obtained food from earliest times in different zones	257_1	200	327	168	45	18	46.7_1
use of food (fuel) by human body	463_3	375_3	446_2	221_1	98_1	18	74.6_{10}
body as engine requiring food	309_1	200	327	168	45	18	49.1_1
similarities and differences between engine and human body	309_1	200	327	168	45	18	49.1_1
food used as fuel	309_1	269_1	327	168	45	18	52.3_2
nature and composition	309_1	258_1	327	168	45	18	51.8_2
fuel and body building values of foods	309_1	252_1	327	168	45	18	51.5_2
food requirements of the human body	463_3	375_3	446_2	221_1	98_1	18	74.6_{10}
advantages of a mixed diet	377_2	322_2	446_2	221_1	98_1	18	68.2_8
heat values	309_1	200	327	168	45	18	49.1_1
importance of vitamines	377_2	200	376_1	168	45	18	54.5_3
importance of mineral salts	333_2	200	327	168	98_1	18	52.7_3
making of mixed and balanced diet	266_1	322_2	327	221_1	45	18	55.2_4
balanced diet for school boy, office worker, laborer	257_1	200	327	168	45	18	46.7_1
importance of correct food habits	257_1	200	327	168	45	18	46.7_1
food preparation	396_2	315_2	390_1	219_1	45	18	63.6_6
food cost	309_1	200	327	222_1	45	18	51.6_2
food adulterations	309_1	243_1	327	221_1	45	18	53.5_3
pure food	171	200	327	221_1	45	18	45.2_1
Pure Food and Drugs Act and its importance	309_1	200	327	168	45	18	49.1_1
kinds of foods	325_2	302_2	465_3	168	98_1	18	63.3_8
foods rich in protein, fats, carbohydrates, calcium, iron, phosphorus	171	200	327	168	98_1	18	45.2_1
oleomargarine and butter	171	200	327	168	98_1	18	45.2_1
cocoa	171	200	384_1	168	45	18	45.3_1
cheese	171	200	327	168	98_1	18	45.2_1
milk	171	200	385_1	168	98_1	18	47.8_2
emulsion	171	200	350_1	168	45	18	43.8_1
raw, evaporated and condensed	171	200	327	168	98_1	18	45.2_1
ice cream	171	200	327	168	98_1	18	45.2_1
fruits	257_1	200	327	168	98_1	18	49.2_2
acids in vinegar and fruit juices	238_1	200	327	168	45	18	45.8_1
baking powder, action of	171	302_2	327	168	45	18	47.4_2
conservation of foods	420_3	248_1	327	220_1	45	18	58.8_5
conservation of foods in home	420_3	247_1	327	168	45	18	56.4_4
garden products	352_2	200	327	168	45	18	51.1_2
harvesting	266_1	200	327	168	45	18	47.1_1
storing	266_1	200	327	168	45	18	47.1_1
caring for stored foods	352_2	200	327	168	45	18	51.1_2
general processes of all preserving processes	420_3	248_1	327	220_1	45	18	58.8_5
preservation and care of food in home	420_3	247_1	327	168	45	18	56.4_4
care of meats, milk and vegetables for immediate use	333_2	200	327	168	45	18	50.2_2
care of home refrigerator	333_2	200	327	168	45	18	50.2_2
cooking utensils	238_1	200	327	168	98_1	18	48.3_2
ironware, tinplated ware, aluminum, enamel ware	171	200	327	168	98_1	18	45.2_1
care of cooking utensils	238_1	200	327	168	45	18	45.8_1
how the body uses foods	377_2	381_3	434_2	247_1	45	18	69.1_8
digestion of foods (starch, protein, fats)	377_2	328_2	378_1	247_1	45	18	64.0_6

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
FOOD — Concluded							
with emphasis upon structural adaptations	309_1	200	327	168	45	18	49.1_{11}
thorough mastication	257_1	200	327	168	45	18	46.7_{11}
absorption of foods	309_1	200	327	247_1	45	18	52.8_{2}
with reference to structural adaptations	309_1	200	327	168	45	18	49.1_{11}
distribution of foods with reference to structural adaptations	309_1	200	327	168	45	18	49.1_{11}
importance of circulation of blood to muscles, kidneys, liver, lungs, intestines	266_1	200	327	168	45	18	47.1_{11}
importance of circulation of blood to cuts and bruises	266_1	302_2	327	220_1	45	18	54.2_{4}
first aid methods	266_1	301_2	327	220_1	45	18	54.2_{4}
effects of exercise upon food consumption, absorption and circulation	309_1	200	327	168	45	18	49.1_{11}
hygiene of the skin and excretory system	309_1	245_1	327	168	45	18	51.2_{2}
efficiency of human body	377_2	381_3	434_2	220_1	45	18	67.9_{8}
aids: any six, emphasis upon proper food, exercise and sleep	309_1	200	327	168	45	18	49.1_{11}
handicaps: any six, emphasis upon effects of stimulants and narcotics	377_2	381_3	434_2	220_1	45	18	67.9_{8}
drugs	171	269_1	380_1	220_1	45	18	50.8_{3}
alcohol	171	269_1	376_1	168	45	18	48.1_{2}
coffee	171	200	381_1	168	45	18	45.2_{1}
longevity	171	200	387_1	168	45	18	45.5_{1}
HEALTH EDUCATION	463_3	443_4	656_5	347_3	98_1	37_1	94.1_{17}
microorganisms and their work	463_3	440_4	656_5	347_3	98_1	36_1	93.9_{17}
forms, size and abundance	377_2	441_4	527_3	168	45	36_1	73.4_{10}
nature of bacteria	377_2	390_3	527_3	168	45	36_1	71.0_{9}
nature of yeasts	309_1	441_4	388_1	168	45	18	63.0_{6}
nature of molds	309_1	392_3	497_3	168	45	18	65.8_{7}
where they are found	309_1	200	327	168	45	18	49.1_{11}
conditions favorable to their growth	309_1	249_1	327	168	45	18	51.4_{2}
their effect upon man and his environment	309_1	360_3	470_2	343_3	98_1	18	73.6_{10}
as beneficial agents	309_1	310_2	378_1	247_1	45	18	60.1_{5}
in manufacture of cheese	309_1	200	327	168	45	18	49.1_{11}
in manufacture of butter	309_1	200	327	168	45	18	49.1_{11}
in manufacture of linen	309_1	200	327	168	45	18	49.1_{11}
in manufacture of leather	309_1	200	327	168	45	18	49.1_{11}
in breadmaking	309_1	294_2	327	168	45	18	53.5_{3}
in fermentation	309_1	200	327	168	45	18	49.1_{11}
in producing nitrogen compounds in the soil	309_1	257_1	378_1	246_1	45	18	57.6_{4}
as scavengers causing decomposition of dead organic matter	309_1	200	327	168	45	18	49.1_{11}
in manufacture of alcohol	309_1	200	327	168	45	18	49.1_{11}
as harmful agents	309_1	307_2	470_2	265_2	45	18	65.1_{7}
causing decay of foods	309_1	249_1	327	168	45	18	51.4_{2}
causing disease through production of toxins	309_1	307_2	470_2	265_2	45	18	65.1_{7}
methods of entering the body and parts attacked in two typical diseases	309_1	200	327	168	45	18	49.1_{11}
germ diseases	171	200	470_2	265_2	45	18	53.8_{4}
non-germ diseases	171	200	327	264_2	45	18	47.2_{2}

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
HEALTH EDUCATION — Continued							
control of microorganisms	463_3	439_4	656_5	347_3	98_1	18	93.0_{16}
production of conditions unfavorable to growth	377_2	290_2	327	168	98_1	18	58.8_5
by canning, pickling, drying	309_1	200	327	168	45	18	49.1_1
by pasteurization	309_1	241_1	327	168	45	18	51.0_2
by cold storage	309_1	200	327	168	45	18	49.1_1
by use of antiseptics	377_2	200	327	168	98_1	18	54.7_3
deodorizers	171	200	327	168	98_1	18	45.2_1
by disinfection	377_2	248_1	327	168	98_1	18	56.9_4
common disinfectants in chemical form	333_2	285_2	327	168	98_1	18	56.6_5
chlorine	171	285_2	327	168	45	18	46.6_2
carbolic acid	171	200	327	168	98_1	18	45.2_1
formaldehyde	171	200	327	168	98_1	18	45.2_1
creosote	171	200	327	168	98_1	18	45.2_1
pine oil	171	200	327	168	98_1	18	45.2_1
bleaching powder	171	200	327	168	98_1	18	45.2_1
bichloride of mercury	171	200	327	168	98_1	18	45.2_1
dangers from use of	171	200	327	168	98_1	18	45.2_1
protection of body from disease	463_3	361_3	393_1	259_2	98_1	18	73.3_{16}
by control of disease-carrying insects	377_2	255_1	393_1	259_2	98_1	18	64.4_7
flies	377_2	200	327	168	98_1	18	54.7_3
lice	309_1	200	327	168	45	18	49.1_1
fleas	309_1	200	327	168	45	18	49.1_1
mosquitoes	377_2	241_1	327	168	45	18	54.1_3
bedbugs	309_1	200	327	168	98_1	18	51.5_2
by immunity	463_3	248_1	327	168	45	18	58.4_4
natural and artificial	377_2	248_1	327	168	45	18	54.4_3
vaccines, anti-toxins, serums	377_2	248_1	327	168	45	18	54.4_3
methods of maintaining resistance to disease	463_3	200	327	168	45	18	56.2_3
through proper clothing	396_3	200	327	168	45	18	53.1_2
through proper food	377_2	200	327	168	45	18	52.2_2
through proper care of skin	309_1	200	327	168	45	18	49.1_1
through proper exercise, sleep	377_2	200	327	168	45	18	52.2_2
value of toothpastes and powders	266_1	200	327	168	45	18	47.1_1
biographies of Jenner, Lister, Pasteur	377_2	200	327	168	45	18	52.2_2
protection of community from disease	377_2	333_2	327	168	45	18	58.4_4
responsibility of individual	309_1	200	327	168	45	18	49.1_1
in knowing and observing community health regulation	309_1	200	327	168	45	18	49.1_1
in knowing and practising laws of health	309_1	200	327	168	45	18	49.1_1
responsibility of board of health	377_2	248_1	327	168	45	18	54.4_3
in controlling sources and handling of milk and solid foods	309_1	200	327	168	45	18	49.1_1
in preventing food adulterations	309_1	200	327	168	45	18	49.1_1
in controlling sources and handling of water supply	377_2	248_1	327	168	45	18	54.4_3
in prevention and control of epidemics through quarantine and disinfectants	309_1	248_1	327	168	45	18	51.3_2
importance of selecting efficient health officers and giving them suitable authority	333_2	200	327	168	45	18	50.2_2
garbage disposal	266_1	200	327	168	45	18	47.1_1
nature of garbage and importance of proper disposal	266_1	200	327	168	45	18	47.1_1

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
HEALTH EDUCATION — Concluded							
garbage receptacles	266_1	200	327	168	45	18	47.1_1
dangers from flies — prevention	266_1	200	327	168	45	18	47.1_1
collection and disposal of garbage on farms, in villages and in cities	266_1	200	327	168	45	18	47.1_1
relation to health	266_1	200	327	168	45	18	47.1_1
garbage products and values	266_1	200	327	168	45	18	47.1_1
HEAT	463_3	445_4	530_4	291_2	98_1	37_1	85.8_{15}
some important sources of	333_2	298_2	350_1	168	45	36_1	56.6_6
the sun	333_2	200	350_1	168	45	18	51.3_3
concentration of heat dependent upon angle of sun's rays	238_1	200	327	168	45	18	45.8_1
air not heated by downward passage of sunbeams	238_1	200	327	168	45	18	45.8_1
importance of atmosphere in holding heat	238_1	200	327	168	45	18	45.8_1
reason for variation in temperature	238_1	200	327	168	45	18	45.8_1
between morning and noon	238_1	200	327	168	45	18	45.8_1
between summer and winter	238_1	200	327	168	45	18	45.8_1
ability of earth, air and water to absorb and hold heat	238_1	200	327	168	45	18	45.8_1
distribution of heat by ocean currents and winds	238_1	200	327	168	45	18	45.8_1
heat belts of the earth	238_1	200	327	168	45	18	45.8_1
oxidation	333_2	250_1	327	168	45	18	52.5_3
friction	238_1	250_1	327	168	45	36_1	49.0_3
compression	238_1	200	327	168	45	18	45.8_1
chemical action	238_1	200	327	168	45	18	45.8_1
electric current	238_1	200	327	168	45	18	45.8_1
theoretical nature of heat	171	297_2	327	168	45	18	47.2_2
some laws of heat	171	270_1	327	168	45	18	46.0_1
some effects of heat upon matter (gases, liquids and solids)	377_2	296_2	350_1	168	45	18	57.7_5
change of state	333_2	200	350_1	168	45	18	51.3_3
evaporation	238_1	200	350_1	168	45	18	46.9_2
boiling	238_1	200	350_1	168	45	18	46.9_2
expansion of solids, liquids and gases	171	296_2	350_1	168	45	18	48.2_3
relation between heat, fuel, and fuel elements	266_1	200	327	168	45	18	47.1_1
relation of coal to gas and both to electricity	171	200	327	168	98_1	18	45.2_1
use of heat in warming home	420_3	370_3	392_1	168	98_1	37_1	68.3_9
early methods	420_3	200	327	168	45	18	54.2_3
fireplace	420_3	200	327	168	45	18	54.2_3
Roman hypocaust	257_1	200	327	168	45	18	46.7_1
modern methods	420_3	251_1	393_1	168	98_1	18	62.0_6
trapping heat in sunparlors and cold frames	237_1	200	327	168	45	18	45.8_1
construction, principle, care and control of stove	420_3	200	327	168	98_1	18	56.7_4
application of principle to at least one type of home heating apparatus	420_3	200	327	168	45	18	54.2_3
gas and oil heaters	238_1	200	327	168	45	18	45.8_1
heating effects of electricity	420_3	251_1	327	168	98_1	18	59.0_5
uses of electric heat in home	420_3	251_1	327	168	98_1	18	59.0_5
heater	400_3	251_1	327	168	98_1	18	58.1_5
toaster	325_2	200	327	168	98_1	18	52.3_3

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
HEAT — Continued							
bed-warmer	238_1	200	327	168	45	18	45.8_1
range	325_2	200	327	168	45	18	49.8_2
iron	171	200	327	168	98_1	18	45.2_1
heating systems	396_2	244_1	393_1	168	98_1	18	60.5_5
relative values of	171	200	327	168	98_1	18	45.2_1
relative efficiency of chief heating apparatus	171	200	327	168	98_1	18	45.2_1
hot air heating systems	238_1	200	327	168	45	18	45.8_1
hot water systems	396_2	200	327	168	45	18	53.1_2
construction, care and control of hot water boiler	377_2	200	327	168	45	18	52.2_2
thorough study of one type of water heating system and application of its principle	396_2	200	327	168	45	18	53.1_2
steam system	463_3	200	327	168	45	18	56.2_3
construction, care and control of steam heating plant	463_3	200	327	168	45	18	56.2_3
insulating material for pipes	171	200	327	168	98_1	18	45.2_1
manipulation of furnaces	171	200	327	168	98_1	18	45.2_1
thermostat	237_1	200	327	168	45	18	45.8_1
three types of heat distribution	463_3	436_4	415_2	168	98_1	37_1	74.4_{11}
conduction	377_2	310_2	415_2	168	45	18	61.3_6
radiation	377_2	310_2	350_1	168	45	18	58.3_5
convection	377_2	310_2	350_1	168	45	18	58.3_5
ventilation and principle of	463_3	436_4	350_1	168	98_1	37_1	71.4_{10}
meaning and importance of ventilation in home, school, church, etc.	463_3	200	327	168	98_1	18	58.6_4
how to ventilate properly a room and a home	420_3	200	327	168	45	18	54.2_3
modern methods of ventilation involving temperature, humidity and movement of air (conduction and convection)	352_2	244_1	327	168	98_1	18	54.3_4
different systems	238_1	244_1	327	168	45	18	47.8_2
fan system	238_1	200	327	168	45	18	45.8_1
direct window	238_1	200	327	168	45	18	45.8_1
washed air	238_1	200	327	168	45	18	45.8_1
heat distribution in relation to type of heating apparatus used in home and school	352_2	200	327	168	45	18	51.1_2
adaptations for ventilation used with each method studied	352_2	200	327	168	45	18	51.1_2
thermos bottle	237_1	200	327	168	45	18	45.8_1
fireless cookers	305_2	200	327	168	45	18	48.9_2
woolen clothing in winter	325_2	200	327	168	98_1	18	52.3_3
linen or cotton clothing in warm weather	325_2	200	327	168	98_1	18	52.3_3
health and heat	420_3	359_3	350_1	168	98_1	18	65.0_8
normal body temperature	325_2	200	327	168	98_1	18	52.3_3
bad effects of overheated rooms	238_1	200	327	168	98_1	18	48.3_2
physiological results of heat in the hot belts	238_1	200	327	168	45	18	45.8_1
use of thermometer	171	200	327	168	98_1	18	45.2_1
humidifying air	420_3	359_3	350_1	168	98_1	18	65.0_8
effects of absorption and evaporation on health	171	200	327	168	98_1	18	45.2_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
HEAT — Concluded							
quantity of heat (calorie)	238_1	375_3	327	168	45	36_1	54.7_5
specific heat	171	258_1	327	168	45	18	45.4_1
gas engines	325_2	417_4	568_4	210_1	98_1	18	75.3_{12}
identification of a good motor	171	200	327	168	98_1	18	45.2_1
mechanical parts of a gas engine	325_2	200	327	168	45	18	49.8_2
exhaust	325_2	200	327	168	45	18	49.8_2
cooling system	325_2	200	327	168	45	18	49.8_2
gas engine operated by heat from fuel	325_2	200	327	168	45	18	49.8_2
LIGHT	463_3	438_4	681_6	293_2	98_1	36_1	92.5_{17}
nature and properties of light	238_1	245_1	327	168	45	18	47.9_2
kinship of light and heat	238_1	200	349_1	168	45	18	46.9_2
rate at which light travels	238_1	200	327	168	45	18	45.8_1
sun as source of natural light	377_2	252_1	387_1	168	45	18	57.4_4
incandescence	238_1	200	327	168	45	18	45.8_1
other sources of light	238_1	200	409_1	168	45	18	49.6_2
moon	238_1	200	327	168	45	18	45.8_1
stars	238_1	200	327	168	45	18	45.8_1
fires	238_1	200	327	168	45	18	45.8_1
phosphorescent material	238_1	200	327	168	45	18	45.8_1
firefly	171	200	409_1	168	45	18	46.5_1
electricity	238_1	200	327	168	45	18	45.8_1
transmission of sunlight	377_2	252_1	327	168	45	18	54.6_3
shadows and reflected light	333_2	200	327	168	45	18	50.2_2
visibility	333_2	200	327	168	45	18	50.2_2
transparent	238_1	200	327	168	45	18	45.8_1
translucent	238_1	200	327	168	45	18	45.8_1
opaque	238_1	200	327	168	45	18	45.8_1
luminous	238_1	200	327	168	45	18	45.8_1
reflection	420_3	255_1	536_4	168	45	36_1	67.2_9
mirrors	171	255_1	327	168	45	18	45.3_1
mirage	171	200	383_1	168	45	18	45.3_1
refraction	420_3	254_1	536_4	168	45	35_1	67.1_9
diffusion	238_1	200	350_1	168	45	18	46.9_2
sunlight in the home	361_2	275_1	327	168	45	18	55.0_3
as affected by windows	361_2	200	327	168	45	18	51.5_2
as affected by shades	361_2	200	327	168	45	18	51.5_2
as affected by wallpaper	361_2	200	327	168	45	18	51.5_2
as affected by hangings	361_2	200	327	168	45	18	51.5_2
color	420_3	255_1	666_8	168	98_1	36_1	75.6_{12}
spectrum colors	420_3	255_1	514_3	168	45	36_1	66.2_8
rainbow	420_3	255_1	514_3	168	45	36_1	66.2_8
appropriate for different rooms	171	200	327	168	98_1	18	45.2_1
to beautify home	171	200	327	168	98_1	18	45.2_1
to create psychological effects (distance, nearness, gaiety)	171	200	327	168	98_1	18	45.2_1
wall and ceiling colors to reflect light	171	200	327	168	98_1	18	45.2_1
relative coefficients of reflection of chief white and colored pigments	171	200	327	168	98_1	18	45.2_1
lenses	302_2	296_2	409_2	168	45	36_1	57.8_7
kinds	171	242_1	350_1	168	45	18	45.7_2
focus	171	200	350_1	168	45	18	43.8_1
magnification	171	200	350_1	168	45	18	43.8_1
sight	463_3	355_3	431_2	168	45	18	68.1_8

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
LIGHT — Continued							
importance of sight	257_1	200	327	168	45	18	46.7_1
good eyesight	377_2	200	327	168	45	18	52.2_2
aids: any four — emphasis on proper lighting and care of eyes	377_2	200	327	168	45	18	52.2_2
spectacles	237_1	200	327	168	45	18	45.8_1
handicaps: any four — emphasis on over use and improper lighting	377_2	200	327	168	45	18	52.2_2
defects of eye	352_2	200	327	168	45	18	51.1_2
near and far sight	325_2	200	327	168	45	18	51.1_2
astigmatism	325_2	200	327	168	45	18	51.1_2
principle and use of lenses in correcting defective eyesight	352_2	200	327	168	45	18	51.1_2
color blindness	325_2	200	327	168	45	18	49.8_2
the eye	463_3	302_2	381_1	168	45	18	63.4_3
structure and functions	171	302_2	381_1	168	45	18	49.9_2
camera	463_3	302_2	381_1	168	45	18	63.4_3
camera and human eye	463_3	302_2	381_1	168	45	18	63.4_3
structures common to each and their functions	463_3	200	327	168	45	18	56.2_3
kinds and uses of optical instruments	257_1	296_2	384_1	249_1	45	18	57.5_3
stories of invention of optical instruments	237_1	200	327	168	45	18	45.8_1
reading glass	257_1	242_1	327	168	45	18	48.7_2
telescopes	257_1	242_1	327	168	45	18	48.7_2
great astronomical telescopes	257_1	200	327	168	45	18	46.7_1
Galileo and the telescope	237_1	200	327	168	45	18	45.8_1
spectroscope	237_1	200	327	168	45	18	45.8_1
microscope	171	200	327	249_1	45	18	46.5_1
opera glasses	257_1	242_1	327	168	45	18	48.7_2
binoculars	237_1	200	327	168	45	18	45.8_1
opaque projection	237_1	200	327	168	45	18	45.8_1
moving pictures	237_1	253_1	384_1	168	45	18	50.9_3
artificial lighting	448_3	373_3	442_2	168	98_1	18	71.2_9
early types	352_2	247_1	381_1	168	45	18	55.7_4
bonfires	325_2	200	327	168	45	18	49.8_2
pine torch	238_1	200	327	168	45	18	45.8_1
rush light	238_1	200	327	168	45	18	45.8_1
production of light by burning candle	352_2	200	327	168	45	18	51.1_2
sperm oil dips	266_1	200	327	168	45	18	47.1_1
construction, care and use of lamp	420_3	247_1	381_1	168	45	18	58.9_6
kerosene lamp	352_2	247_1	381_1	168	45	18	55.7_4
fish tail gas jet	266_1	200	327	168	45	18	47.1_1
modern types	448_3	298_2	389_1	168	98_1	18	65.3_7
gas mantle	333_2	247_1	327	168	98_1	18	54.8_4
kinds of mantles	237_1	200	389_1	168	98_1	18	51.1_2
principle of mantle, jet and incandescent lamp	352_2	251_1	327	168	45	18	53.5_3
relative costs and efficiency	352_2	251_1	327	168	45	18	53.5_3
acetylene	171	247_1	327	168	45	18	44.9_1
electric lighting	420_3	298_2	327	168	98_1	18	61.2_6
incandescent bulb	420_3	298_2	327	168	98_1	18	61.2_6
carbon and tungsten	400_3	200	327	168	98_1	18	55.7_4
candle power	237_1	200	327	168	45	18	45.8_1
electric signs	237_1	200	327	168	45	18	45.8_1
arc light	305_2	200	327	168	45	18	48.9_2

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
LIGHT — Concluded							
relative brightness of chief illuminants	171	200	327	168	98_1	18	45.2_1
direct and indirect lighting	361_2	200	327	168	98_1	18	53.9_3
shades and reflectors	171	200	327	168	98_1	18	45.2_1
types of fixtures	361_2	200	327	168	45	18	51.5_2
proper light intensity for illuminating homes	333_2	200	327	168	98_1	18	52.7_3
cost of installation and operation	238_1	200	327	168	45	18	45.8_1
proper lighting apparatus for dark rooms	294_1	200	327	168	98_1	18	50.8_2
photography	325_2	305_2	445_2	168	45	18	60.1_6
chemical action of light	238_1	200	327	168	45	18	45.8_1
developing and printing	238_1	200	327	168	45	18	45.8_1
photograph	171	200	382_1	168	45	18	45.3_1
making motion pictures	325_2	200	327	168	45	18	49.8_2
radio photography	171	200	385_1	168	45	18	45.4_1
light and its relation to life	238_1	272_1	327	168	45	18	49.1_2
service of light	238_1	200	327	168	45	18	45.8_1
lengthens day for work and play	238_1	200	327	168	45	18	45.8_1
makes plants grow	238_1	200	327	168	45	18	45.8_1
is a good disinfectant	238_1	200	327	168	45	18	45.8_1
is necessary for vision	238_1	200	327	168	45	18	45.8_1
LIVING THINGS	420_3	440_4	672_5	349_3	98_1	37_1	92.8_{17}
how living things differ from non-living	238_1	355_3	451_2	168	45	18	58.7_6
life requires air, water, food, light, heat	238_1	200	327	168	45	18	45.8_1
life distinguished by ability to organize protoplasm into cells	238_1	294_2	327	168	45	18	50.2_3
properties of protoplasm	171	241_1	327	168	45	18	44.6_1
study of cell	171	248_1	327	168	45	18	45.0_1
by ability to grow and maintain activity	238_1	200	385_1	168	45	18	48.5_2
by ability to respond to environment	238_1	200	327	168	45	18	45.8_1
by ability to reproduce	238_1	348_3	327	168	45	18	52.6_4
the facts of degeneration and death	238_1	200	327	168	45	18	45.8_1
decay	171	200	393_1	168	45	18	45.7_1
plants	420_3	434_4	662_5	305_2	98_1	37_1	90.1_{16}
the living plant in the soil	266_1	304_2	327	219_1	45	36_1	55.1_5
general interest in plants	171	200	327	219_1	45	18	45.1_1
factors affecting the growth of plants	266_1	304_2	327	168	45	36_1	52.8_4
soils	266_1	200	327	168	45	18	47.1_1
water	266_1	200	327	168	45	18	47.1_1
aeration	266_1	200	327	168	45	18	47.1_1
fertilizers	266_1	304_2	327	168	45	36_1	52.8_4
cover crops	266_1	200	327	168	45	18	47.1_1
animals	266_1	200	327	168	45	18	47.1_1
other plants	266_1	200	327	168	45	18	47.1_1
climate	266_1	200	327	168	45	18	47.1_1
conservation of plants	171	200	327	218_1	45	18	45.1_1
wild flowers for beauty and pleasure	238_1	200	327	168	45	18	45.8_1
distribution and variety of plants	238_1	287_2	381_1	250_1	98_1	18	58.6_6
saprophytes	238_1	287_2	327	250_1	98_1	18	56.1_5
higher Fungi, toadstools, etc.	171	287_2	327	250_1	98_1	18	53.0_4
Algae	171	245_1	327	168	45	18	44.8_1
mosses	171	241_1	381_1	168	45	18	47.1_2
ferns	171	241_1	327	168	45	18	44.6_1
grass	238_1	200	380_1	168	45	18	48.3_2
grasslands for grazing	238_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
LIVING THINGS — Continued							
miscellaneous types of plant life	171	248_1	385_1	218_1	45	18	49.9_2
Venus Fly Trap	171	200	385_1	168	45	18	45.4_1
obnoxious plants	171	200	327	218_1	45	18	45.1_1
color in plants	171	200	389_1	168	45	18	45.6_1
economic aspects of plants (crops)	325_2	358_2	497_3	302_2	45	18	71.1_{10}
green plants are food makers of world	238_1	200	327	168	45	18	45.8_1
relation of roots to absorption and distribution of water	238_1	302_2	327	168	45	18	50.5_3
relation of stems to absorption and distribution of water	238_1	299_2	327	168	45	18	50.4_3
relation of flowers to seed formation — grains	325_2	301_2	327	168	45	18	54.5_4
trees	333_2	378_3	657_5	341_2	98_1	18	84.0_{14}
values in soil enrichment	333_2	200	327	168	98_1	18	52.7_3
values in shade	333_2	200	327	168	98_1	18	52.7_3
values in beautifying	333_2	200	327	168	98_1	18	52.7_3
values in food	333_2	200	327	168	98_1	18	52.7_3
values in homes for birds	333_2	200	327	168	98_1	18	52.7_3
parts of typical tree and their functions	266_1	254_1	327	168	45	18	49.6_2
tree as type of stem	171	254_1	327	168	45	18	45.2_1
planting of trees	266_1	200	327	219_1	45	18	49.5_2
city and town regulations	266_1	200	327	168	45	18	47.1_1
desirable kinds and methods of planting	266_1	200	327	168	45	18	47.1_1
correlation with Scout activities	266_1	200	327	168	45	18	47.1_1
memorial planting	171	200	327	219_1	45	18	45.1_1
horticulture	171	247_1	501_3	300_2	45	18	58.9_6
artificial propagation	171	247_1	501_3	168	45	18	52.9_4
budding	171	200	501_3	168	45	18	50.7_3
grafting	171	200	501_3	168	45	18	50.7_3
protection of trees	352_2	200	327	219_1	45	18	53.5_3
enemies and control of	266_1	200	327	168	45	18	47.1_1
friends and their protection	266_1	200	327	168	45	18	47.1_1
community regulations for care and protection	266_1	200	327	168	45	18	47.1_1
forest fires	257_1	200	327	219_1	45	18	49.1_2
forestry	333_2	255_1	439_2	264_2	45	18	62.3_7
economic value of wooded areas	333_2	200	388_1	218_1	45	18	55.4_4
in making soil	266_1	200	327	168	45	18	47.1_1
in regulating stream flow	333_2	200	327	168	45	18	50.2_2
in cooling atmosphere	266_1	200	327	168	45	18	47.1_1
as homes for animals	266_1	200	327	168	45	18	47.1_1
in producing food	333_2	200	327	168	45	18	50.2_2
in producing lumber	333_2	200	327	168	45	18	50.2_2
in producing fuel	333_2	200	327	168	45	18	50.2_2
in producing rubber	266_1	200	388_1	218_1	45	18	52.2_3
in producing pulp	333_2	200	327	168	45	18	50.2_2
recreation value	171	200	327	218_1	45	18	45.1_1
conservation	333_2	200	377_1	261_2	45	18	56.8_5
meaning of	333_2	200	377_1	261_2	45	18	56.8_5
importance of	333_2	200	377_1	261_2	45	18	56.8_5
methods of local conservation	266_1	200	377_1	261_2	45	18	53.7_4
reforestation	171	200	377_1	261_2	45	18	49.3_3
a typical green plant (bean or corn)	377_3	374_3	659_5	219_1	45	18	77.9_{11}

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
LIVING THINGS — Continued							
parts and functions with essential structures	377_2	257_1	327	168	45	18	54.8_2
special structures	377_2	302_2	659_5	168	45	18	72.2_9
root hairs	377_2	302_2	327	168	45	18	56.9_4
stems	377_2	299_2	327	168	45	18	56.8_4
leaves	377_2	296_2	381_1	168	45	18	59.1_5
structure of	171	251_1	327	168	45	18	45.1_1
structure and function of flowers	171	373_3	659_5	168	45	18	65.9_8
seeds — dispersal and germination	171	296_2	327	168	45	18	47.1_2
sap of plants, juices, etc.	171	241_1	327	168	45	18	44.6_1
osmosis: meaning and importance to plants	309_1	300_2	327	168	45	18	53.7_2
transpiration	171	251_1	327	168	45	18	45.1_1
photosynthesis	377_2	304_2	381_1	219_1	45	18	61.9_6
oxygen cycle	361_2	200	327	168	45	18	51.5_2
the balanced aquarium: principle and care: general applications	294_1	200	327	168	45	18	48.4_1
the garden	420_3	345_3	584_4	340_3	98_1	36_1	84.0_{15}
garden and farm soils	266_1	200	327	209_1	98_1	36_1	52.3_4
composition	266_1	200	327	168	45	18	47.1_1
relative fertility	266_1	200	327	168	45	18	47.1_1
its preparation for plant growth	266_1	200	327	168	45	18	47.1_1
values of different methods used	266_1	200	327	168	45	18	47.1_1
methods of improvement	266_1	200	327	168	45	18	47.1_1
planning the garden	266_1	200	327	168	98_1	18	49.6_2
nature and habits of commonly grown plants	171	200	327	168	98_1	18	45.2_1
seed testing	266_1	200	327	168	45	18	47.1_1
hot bed and cold frame	266_1	200	327	168	45	18	47.1_1
ideal garden plan	266_1	200	327	168	45	18	47.1_1
fitting ideal plan to individual garden	266_1	200	327	168	45	18	47.1_1
landscape gardening	238_1	253_1	380_1	168	98_1	18	53.1_4
plants for beauty and pleasure	238_1	200	380_1	168	98_1	18	50.7_3
shrubs	238_1	200	327	168	98_1	18	48.3_2
flowers	238_1	200	327	168	98_1	18	48.3_2
grass	238_1	200	380_1	168	45	18	48.3_2
wild flowers	238_1	200	327	168	45	18	45.8_1
vines	171	200	327	168	98_1	18	45.2_1
planting and cultivating the garden	266_1	244_1	389_1	168	45	36_1	52.9_4
relation of aeration and capillarity to soil conditions	266_1	200	327	168	45	18	47.1_1
plant nutrition	171	242_1	327	168	45	18	44.7_1
plant growth	171	200	384_1	168	45	18	45.3_1
methods of planting and transplanting	266_1	200	327	168	45	18	47.1_1
flower culture	171	200	389_1	168	45	18	45.6_1
weeds	171	200	441_2	168	45	18	48.0_2
insect pests	333_2	243_1	527_3	287_2	45	18	66.9_8
habits and adaptations of some common garden pests	333_2	200	327	168	45	18	50.2_2
methods of control and extermination	333_2	200	327	168	45	18	50.2_2
plant diseases	266_1	243_1	453_2	219_1	45	18	57.3_5
methods of control and extermination of at least two	266_1	200	327	168	45	18	47.1_1
extermination of rodents	238_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
LIVING THINGS — Continued							
some animal friends of the garden	333_2	200	327	246_1	45	18	53.8_2
insects	333_2	200	327	168	45	18	50.2_2
ladybird beetle	333_2	200	327	168	45	18	50.2_2
butterfly	266_1	200	327	168	45	18	47.1_1
honeybee	333_2	200	327	168	45	18	50.2_2
habits and adaptations	266_1	200	327	168	45	18	47.1_1
methods of protection	266_1	200	327	168	45	18	47.1_1
toads	266_1	200	327	168	45	18	47.1_1
life history and habits	266_1	200	327	168	45	18	47.1_1
care and protection	266_1	200	327	168	45	18	47.1_1
birds	333_2	200	327	168	45	18	50.2_2
kinds	266_1	200	327	168	45	18	47.1_1
habits	266_1	200	327	168	45	18	47.1_1
food	266_1	200	327	168	45	18	47.1_1
adaptations	266_1	200	327	168	45	18	47.1_1
how to attract and protect birds	266_1	200	327	168	45	18	47.1_1
agriculture	266_1	200	453_2	310_3	45	18	59.4_5
farm crops	171	200	389_1	168	45	18	45.6_1
alfalfa	171	200	388_1	168	45	18	45.5_1
corn	171	200	388_1	168	45	18	45.5_1
popcorn	171	200	385_1	168	45	18	45.4_1
farm animals	171	200	451_2	168	45	18	48.4_2
farm machinery	171	200	385_1	168	45	18	45.4_1
dry farming	266_1	200	327	168	45	18	47.1_1
principles involved and where used	266_1	200	327	168	45	18	47.1_1
reclamation of swamps and arid districts	266_1	200	327	168	45	18	47.1_1
principles involved and where practised	266_1	200	327	168	45	18	47.1_1
agricultural products as basis of national wealth	266_1	200	327	222_1	45	18	49.6_2
development of agriculture	266_1	200	327	222_1	45	18	49.6_2
early history	266_1	200	327	221_1	45	18	49.6_2
improvement in implements and methods	266_1	200	327	168	45	18	47.1_1
improvement in crop production	266_1	200	327	168	45	18	47.1_1
yearly production and consumption of food products in U. S.	257_1	200	327	222_1	45	18	49.2_2
shipping and packing	171	200	327	222_1	45	18	45.2_1
plants and clothing	325_2	253_1	434_2	248_1	45	18	60.9_6
cotton	325_2	200	327	168	45	18	49.8_2
from cotton field to handkerchief	237_1	200	379_1	168	45	18	48.2_2
cotton gin	237_1	200	327	168	45	18	45.8_1
flax	325_2	200	327	168	45	18	49.8_2
from flaxfield to tablecloth	305_2	200	327	168	45	18	48.9_2
artificial silk	171	200	383_1	168	45	18	45.3_1
plants in industry	328_1	243_1	497_3	220_1	98_1	18	60.5_7
hemlock bark in tanning	238_1	200	327	168	45	18	45.8_1
spruce wood for paper making	238_1	200	327	168	45	18	45.8_1
cotton for explosives	238_1	200	327	168	45	18	45.8_1
rubber	171	200	378_1	168	98_1	18	47.5_2
hard woods for furniture	238_1	200	327	168	98_1	18	48.3_2
lumbering	238_1	200	327	168	45	18	45.8_1
dyeing	238_1	243_1	497_3	168	45	18	55.6_5
dyes	238_1	200	444_2	168	45	18	51.2_3
perfumes	238_1	241_1	327	168	45	18	47.7_2

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
LIVING THINGS — Continued							
medicines	238_1	200	327	168	45	18	45.8_1
oils for paint, fertilizer and soaps	238_1	200	327	168	45	18	45.8_1
flavoring extracts	171	241_1	327	168	45	18	44.6_1
animals	333_2	424_4	666_5	346_3	98_1	37_1	87.7_{16}
survey of animal kingdom	333_2	379_3	643_5	300_2	98_1	36_1	82.4_{14}
vertebrates and invertebrates	238_1	250_1	327	218_1	45	18	50.5_3
distinguishing features	238_1	200	327	168	45	18	45.8_1
distribution and numbers	238_1	245_1	327	218_1	45	18	50.3_3
invertebrates	333_2	250_1	505_3	251_1	98_1	18	67.0_8
Ameba	171	247_1	327	168	45	18	44.9_1
sponges	171	200	389_1	168	45	18	45.6_1
hydra and coral	171	200	390_1	168	45	18	45.6_1
worms	238_1	244_1	327	168	45	18	47.9_2
mollusks	171	241_1	327	245_1	45	18	48.2_2
spiders	171	200	453_2	168	45	18	48.5_2
insects	333_2	250_1	505_3	251_1	98_1	18	67.0_8
bees	266_1	200	391_1	168	45	18	50.1_2
crayfish	171	241_1	327	168	45	18	44.6_1
vertebrates	266_1	247_1	597_4	291_2	45	18	67.4_3
amphibians	171	247_1	391_1	247_1	45	18	51.5_3
frogs	171	247_1	391_1	168	45	18	47.8_2
life history of frog	171	247_1	327	168	45	18	44.9_1
reptiles	171	243_1	542_3	250_1	45	18	58.4_5
snakes	171	200	542_3	168	45	18	52.6_3
turtles	171	200	387_1	168	45	18	45.5_1
fish	171	244_1	597_4	291_2	45	18	62.8_7
conservation of fish	171	200	327	219_1	45	18	45.1_1
deep sea fish	171	200	381_1	168	45	18	45.2_1
birds	286_1	245_1	526_3	291_2	45	18	64.1_7
songbirds	171	200	458_2	168	45	18	48.8_2
pigeons	171	200	376_1	168	45	18	45.0_1
mammals	171	244_1	395_1	252_1	45	18	51.8_3
land mammals	171	200	395_1	168	45	18	45.9_1
man	171	240_1	327	252_1	45	36_1	49.3_3
prehistoric man	171	240_1	327	168	45	18	44.6_1
life processes in animals	171	379_3	643_5	300_2	45	18	71.6_{10}
the human body	171	379_3	643_5	300_2	45	18	71.6_{10}
hygiene, miscellaneous discussion	171	303_2	451_2	168	45	18	53.2_4
physiology, elements of	171	332_2	395_1	300_2	45	18	58.0_5
the special senses	171	241_1	327	168	45	18	44.6_1
touch	171	241_1	327	168	45	18	44.6_1
taste	171	241_1	327	168	45	18	44.6_1
smell	171	240_1	327	168	45	18	44.6_1
anatomy	171	289_3	642_5	245_1	45	18	64.9_8
blood	171	200	381_1	245_1	45	18	48.8_2
the nervous system	171	248_1	387_1	168	45	18	47.7_2
skeleton and bones	171	247_1	327	168	45	18	44.9_1
teeth	171	240_1	327	168	45	18	44.6_1
muscles	171	245_1	327	168	45	18	44.8_1
heart	171	200	385_1	168	45	18	45.4_1
human hair	171	200	532_3	168	45	18	52.2_3
pigmentation	171	200	385_1	168	45	18	45.4_1
ductless glands	171	240_1	327	168	45	18	44.6_1
psychology: the mind	171	240_1	455_2	168	45	18	50.4_3

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
LIVING THINGS — Concluded							
instinct	171	241_1	327	168	45	18	44.6_1
habits	171	200	384_1	168	45	18	45.3_1
general interest in animals	238_1	200	327	222_1	45	18	48.3_2
for human interest and diversion (circus) (pets)	238_1	200	327	222_1	45	18	48.3_2
animals useful to man	333_2	243_1	458_2	303_2	45	18	64.5_7
domestic animals	238_1	200	458_2	222_1	45	18	54.4_4
supply food and clothing	238_1	200	327	221_1	45	18	48.3_2
as beasts of burden	238_1	200	327	221_1	45	18	48.3_2
care of	171	200	327	222_1	45	18	45.2_1
domestic fowls	171	200	458_2	168	45	18	48.8_2
eggs	171	200	446_2	168	45	18	48.2_2
silk worms	238_1	243_1	327	168	45	18	47.8_2
animal diseases	171	200	388_1	303_2	45	18	51.8_3
conservation and propagation of animals	238_1	200	383_1	301_1	45	18	54.6_3
of wild animals and birds	238_1	200	327	168	45	18	45.8_1
reason for game laws	238_1	200	327	168	45	18	45.8_1
destruction of predatory animals	238_1	200	327	168	45	18	45.8_1
fishing	171	200	383_1	168	45	18	45.3_1
obnoxious animals	333_2	286_2	393_1	222_1	98_1	18	62.1_7
predatory animals	238_1	200	327	168	45	18	45.8_1
rodents destroy stored food	238_1	241_1	327	168	98_1	18	50.2_3
rats and mice	171	200	327	168	98_1	18	45.2_1
crop eating birds (crows)	171	200	384_1	168	45	18	45.3_1
injurious insects	333_2	285_2	393_1	168	98_1	18	59.6_6
mosquitoes and flies	333_2	241_1	327	168	45	18	52.1_3
boring insects	333_2	241_1	327	168	45	18	52.1_3
moths	238_1	241_1	327	168	45	18	47.7_2
ants	171	200	327	168	98_1	18	45.2_1
cockroaches	171	200	327	168	98_1	18	45.2_1
parasites	171	283_2	327	168	45	18	46.6_2
tape worm	171	243_1	327	168	45	18	44.7_1
evolution	171	200	577_4	343_3	45	18	62.3_7
of man	171	200	327	220_1	45	18	45.1_1
of animals	171	200	327	219_1	45	18	45.1_1
of plants	171	200	327	218_1	45	18	45.1_1
struggle for existence	171	200	327	218_1	45	18	45.1_1
heredity	171	298_2	379_1	209_1	45	18	51.6_4
interrelation of plants and animals	238_1	243_1	327	221_1	45	18	50.3_3
balance of life	238_1	245_1	327	168	45	18	47.9_2
meaning — how maintained	238_1	200	327	168	45	18	45.8_1
natural and artificial selection	171	245_1	327	168	45	18	44.8_1
disturbance of balance — English sparrows	238_1	245_1	327	168	45	18	47.9_2
ways in which animals are helpful to plants (economic importance)	238_1	243_1	327	221_1	45	18	50.3_3
cross pollenation of flowers by insects	238_1	200	327	168	45	18	45.8_1
birds eat insects harmful to plants and trees	238_1	200	327	168	45	18	45.8_1
earthworms aerate soil	238_1	200	327	168	45	18	45.8_1
breeding and improvement	171	200	327	222_1	45	18	45.2_1
new plants	171	200	327	219_1	45	18	45.1_1
improvement of animals	171	200	327	222_1	45	18	45.2_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
MATTER AND ENERGY	463_3	435_4	484_3	250_1	98_1	37_1	81.41_3
mechanics of solids	463_3	435_4	484_3	250_1	98_1	37_1	81.41_3
matter	309_1	429_4	474_3	250_1	45	36_1	71.11_6
law of conservation of matter	171	241_1	327	168	45	18	44.6_1
kinds — inorganic, organic	266_1	200	327	168	45	18	47.1_1
elements	171	429_4	350_1	168	45	36_1	55.2_6
compounds	171	429_4	350_1	168	45	36_1	55.1_6
mixtures	171	429_4	350_1	168	45	18	54.3_5
acids, bases and salts	171	372_3	474_3	245_1	45	18	61.0_7
neutralization	171	244_1	350_1	168	45	18	45.8_2
general and special properties of matter	266_1	352_3	412_2	168	45	18	58.0_6
elasticity	171	200	350_1	168	45	18	43.8_1
scale of hardness of substances	171	240_1	327	168	45	18	44.6_1
stability	171	241_1	412_2	168	45	18	48.5_3
pendulum	171	241_1	327	168	45	18	44.6_1
gyroscope	171	200	390_1	168	45	18	45.6_1
energy	463_3	431_4	415_2	247_1	98_1	36_1	77.81_2
kinds — kinetic and potential	333_2	299_2	327	168	45	18	54.8_4
forms — heat, mechanical, light, electrical, chemical	420_3	200	350_1	168	45	18	55.3_4
energy transformations	333_2	200	327	168	98_1	18	52.7_3
devices used to change heat to a different form of energy	266_1	200	327	168	45	18	47.1_1
mechanical energy transformed to electrical by dynamo	238_1	200	327	168	98_1	18	48.3_2
the sun as a source of energy	377_2	304_2	415_2	168	45	18	61.1_6
some ways in which the sun does work	361_2	200	350_1	168	45	18	52.5_3
direct ways	361_2	200	350_1	168	45	18	52.5_3
heat effects upon air, water and iron	294_1	200	327	168	45	18	48.4_1
mechanical effects upon the radiometer	294_1	200	327	168	45	18	48.4_1
chemical effects upon colored cloth, wall paper, and photographic paper	361_2	200	350_1	168	45	18	52.5_3
indirect ways	294_1	200	327	168	45	18	48.4_1
storage of energy in falling water, fuels, and foods	294_1	200	327	168	45	18	48.4_1
causal relations between sun and mechanical motion in factory	266_1	200	327	168	45	18	47.1_1
relation of solar energy to living things	266_1	200	327	168	45	18	47.1_1
differences in intensity of heat and light rays	266_1	200	327	168	45	18	47.1_1
in relation to plants and animals	266_1	200	327	168	45	18	47.1_1
in relation to peoples	266_1	200	327	168	45	18	47.1_1
in relation to industries	266_1	200	327	168	45	18	47.1_1
in relation to transportation	266_1	200	327	168	45	18	47.1_1
sources and general uses of energy to man in work of water, air, heat, etc.	333_2	200	327	168	45	18	50.2_2
conservation of energy	333_2	200	400_2	168	45	18	53.6_4
conservation of energy applied	266_1	200	327	168	45	18	47.1_1
perpetual motion	171	200	378_1	168	45	18	45.0_1
measuring energy	238_1	241_1	327	168	45	18	47.7_2
chemical change and energy	171	200	350_1	168	45	18	43.8_1
chemical change caused by heat, light and electricity	171	200	350_1	168	45	18	43.8_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
MATTER AND ENERGY — Concluded							
force	171	332_2	327	168	45	36_1	49.7_3
action and reaction	171	200	350_1	168	45	18	43.8_1
resolution of forces	171	248_1	327	168	45	18	44.9_1
construction of bridges	171	240_1	327	168	45	18	44.6_1
meaning and importance of work	420_3	435_4	484_3	250_1	45	37_1	76.9_{12}
kinds — muscular, mechanical, etc.	266_1	200	327	168	45	18	47.1_1
some common obstacles to work	420_3	258_1	400_2	168	45	37_1	61.1_7
relation of friction, weight, and inertia to moving of matter	420_3	258_1	400_2	168	45	18	60.2_6
friction and efficiency of machines	325_2	200	327	168	45	18	49.8_2
lubrication	171	200	327	168	45	36_1	43.6_1
work and mechanics	420_3	435_4	484_3	250_1	45	37_1	76.9_{12}
some simple machines	420_3	375_4	350_1	168	45	37_1	64.2_9
lever	420_3	302_2	350_1	168	45	18	60.0_6
inclined plane	420_3	301_2	327	168	45	18	58.9_5
application of lever to pulley as in home	420_3	296_2	327	168	45	18	58.7_5
application of lever to wheel and axle as in home	266_1	245_1	327	168	45	18	49.2_2
application of inclined plane to wedge and screw as in home	266_1	245_1	327	168	45	18	49.2_2
centrifugal force	237_1	200	398_2	168	45	18	49.1_3
centrifugal machines	237_1	200	327	168	45	18	45.8_1
energy machines	171	259_1	327	168	45	18	45.5_1
some common uses of simple and compound machines in home and immediate environment	370_3	248_1	327	168	45	18	54.1_4
effect on society of labor saving machinery	257_1	200	327	168	45	18	46.7_1
household appliances	171	270_1	327	168	45	18	46.0_1
work of primitive men [in securing]	325_2	200	327	168	45	18	49.8_2
tools	238_1	200	327	168	45	18	45.8_1
clothing	325_2	200	327	168	45	18	49.8_2
housing	325_2	200	327	168	45	18	49.8_2
beasts of burden	238_1	200	327	168	45	18	45.8_1
food (American Indians, Eskimos, African negroes)	238_1	200	327	168	45	18	45.8_1
geographical location of each group	238_1	200	327	168	45	18	45.8_1
means of navigation	238_1	200	327	168	45	18	45.8_1
canoe	238_1	200	327	168	45	18	45.8_1
outrigger boat	238_1	200	327	168	45	18	45.8_1
sailboat	238_1	200	327	168	45	18	45.8_1
sledges	238_1	200	327	168	45	18	45.8_1
SOUND	463_3	418_4	685_6	289_2	98_1	35_1	91.6_{17}
nature of sound	257_1	200	350_1	168	45	18	47.8_2
uses of air to carry sound	463_3	270_1	327	168	45	18	59.4_4
how sound is produced, travels and varies in intensity and rate of speed	443_3	270_1	350_1	168	45	18	59.6_5
relation of sound to life	171	315_2	327	168	45	18	48.0_2
music and noise	325_2	200	350_1	168	45	18	50.9_3
pitch	325_2	200	350_1	168	45	18	50.9_3
intensity	325_2	200	327	168	45	18	49.8_2

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
SOUND — Concluded							
quality	238_1	200	327	168	45	18	45.8_1
rhythm	238_1	200	327	168	45	18	45.8_1
musical scale	257_1	200	327	168	45	18	46.7_1
sound producing instruments	463_3	241_1	498_3	168	98_1	18	68.4_3
bells	309_1	200	327	168	45	18	49.1_1
whistles	309_1	200	327	168	45	18	49.1_1
musical instruments (wind, stringed concussion)	443_3	241_1	498_3	168	98_1	18	67.5_8
piano	237_1	200	380_1	168	45	18	48.2_2
piano player	463_3	200	327	168	45	18	56.2_3
human voice	463_3	241_1	327	168	45	18	58.1_4
mechanism of vocal chords	325_2	200	327	168	45	18	49.8_2
position and relation to breathing	325_2	200	327	168	45	18	49.8_2
difference between soprano and bass voices	238_1	200	327	168	45	18	45.8_1
correct posture and good teeth factors in singing and speaking	238_1	200	327	168	45	18	45.8_1
importance and use of sounds in world	266_1	200	327	168	45	18	47.1_1
reproduction and carrying of sound	376_2	290_2	545_3	168	98_1	18	68.8_8
phonograph	376_2	200	382_1	168	98_1	18	57.1_4
records	171	200	444_2	168	45	18	48.1_2
needles	171	200	327	168	98_1	18	45.2_1
kinds and merits	171	200	327	168	98_1	18	45.2_1
phonograph motor and reproducer	171	200	327	168	98_1	18	45.2_1
adaptation of human ear for receiving sounds	463_3	290_2	327	168	45	18	60.4_5
parts and functions	171	290_2	327	168	45	18	46.9_2
common defects of ear	238_1	200	327	168	45	18	45.8_1
purpose and position of Eustachian tubes and semicircular canals	238_1	200	327	168	45	18	45.8_1
hygiene of the ear	377_2	248_1	327	168	45	18	54.4_3
tests of the hearing	266_1	200	327	168	45	18	47.1_1
reflection of sound	325_2	200	408_2	168	45	35_1	54.4_5
echoes	325_2	200	408_2	168	45	35_1	54.4_5
megaphones	238_1	200	327	168	45	18	45.8_1
stethoscope	238_1	200	327	168	45	18	45.8_1
acoustics	238_1	200	327	168	45	18	45.8_1
influence of draperies	238_1	200	327	168	45	18	45.8_1
shape of room	238_1	200	327	168	45	18	45.8_1
sounding board	238_1	200	327	168	45	18	45.8_1
wires	238_1	200	327	168	45	18	45.8_1
STUDY OF INDUSTRY	420_3	435_4	457_3	247_1	98_1	18	77.1_{12}
sources of energy in industry	266_1	244_1	457_3	247_1	98_1	18	61.2_7
heat, water and electricity	266_1	200	327	168	45	18	47.1_1
explosions	237_1	244_1	457_3	168	98_1	18	56.2_6
the energy of expanding gases	171	200	402_2	168	45	18	46.2_2
firearms	171	200	378_1	168	45	18	45.0_1
use of heat in refining ores	266_1	200	327	168	45	18	47.1_1
nature of ores (oxides and sulphides)	266_1	200	327	168	45	18	47.1_1
roasting (heating in air)	266_1	200	327	168	45	18	47.1_1
reduction with carbon and coke	266_1	200	327	168	45	18	47.1_1
treatment of metals	266_1	256_1	327	168	45	18	49.7_2
principles involved in molding, rolling, cutting and welding metals	266_1	200	327	168	45	18	47.1_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
STUDY OF INDUSTRY — Continued							
important ways in which metals are used in the world	266_1	200	327	168	45	18	47.1_1
power	400_3	273_1	350_1	168	45	18	57.7_5
"horsepower"	237_1	200	327	168	45	18	45.8_1
relation of heat to power	266_1	200	327	168	45	18	47.1_1
materials needed: fuels, water, boiler, engine, etc.	266_1	200	327	168	45	18	47.1_1
devices used to change heat to a different form of energy	266_1	200	327	168	45	18	47.1_1
causal relations between coal and work	266_1	200	327	168	45	18	47.1_1
work of Humphrey	266_1	200	327	168	45	18	47.1_1
relation of water to power	420_3	296_2	327	168	45	18	58.7_5
dams: construction and use	420_3	200	327	168	45	18	54.2_3
locations best suited for dams	325_2	200	327	168	45	18	49.8_2
devices for using water power	420_3	252_1	327	168	45	18	56.6_4
water wheels: types, efficiency and use	420_3	200	327	168	45	18	54.2_3
turbines	420_3	200	327	168	45	18	54.2_3
flumes	266_1	200	327	168	45	18	47.1_1
dynamos	333_2	200	327	168	45	18	50.2_2
wires	266_1	200	327	168	45	18	47.1_1
causal relations between sun and mechanical motion in factory	266_1	200	327	168	45	18	47.1_1
conservation of energy applied	266_1	200	327	168	45	18	47.1_1
work done by Niagara Falls	305_2	200	327	168	45	18	48.9_2
available water power in U. S.	238_1	200	327	168	45	18	45.8_1
Au Sable river	237_1	200	327	168	45	18	45.8_1
some important industries	238_1	243_1	502_3	168	98_1	18	58.3_6
sugar	238_1	200	458_2	168	45	18	51.9_3
food values	238_1	200	327	168	45	18	45.8_1
amounts consumed by America, England, France, Germany	238_1	200	327	168	45	18	45.8_1
sources	238_1	200	327	168	45	18	45.8_1
maple sap	238_1	200	327	168	45	18	45.8_1
cane juice	238_1	200	327	168	45	18	45.8_1
sugar beets	238_1	200	327	168	45	18	45.8_1
relative amounts and places where each is produced	238_1	200	327	168	45	18	45.8_1
syrup	171	200	384_1	168	45	18	45.3_1
sugar making	238_1	200	327	168	45	18	45.8_1
location of factories	238_1	200	327	168	45	18	45.8_1
machinery and equipment	238_1	200	327	168	45	18	45.8_1
details of process	238_1	200	327	168	45	18	45.8_1
marketing	238_1	200	327	168	45	18	45.8_1
economic factors	238_1	200	327	168	45	18	45.8_1
problem of seed from Germany in wartime	238_1	200	327	168	45	18	45.8_1
development of new beet-growing areas	238_1	200	327	168	45	18	45.8_1
investment of capital	238_1	200	327	168	45	18	45.8_1
contract system for growers	238_1	200	327	168	45	18	45.8_1
price to consumers	238_1	200	327	168	45	18	45.8_1
paper	238_1	240_1	499_3	168	98_1	18	58.0_6
importance of	238_1	200	327	168	45	18	45.8_1
materials	238_1	200	327	168	98_1	18	48.3_2

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
STUDY OF INDUSTRY — Concluded							
relative durability	171	200	327	168	98_1	18	45.2_1
methods of making — use of water	238_1	200	327	168	45	18	45.8_1
conservation of forests and paper	238_1	200	327	168	45	18	45.8_1
ink	171	200	445_2	168	45	18	48.2_2
automobiles	325_2	257_1	568_4	210_1	98_1	18	68.9_9
automobile mechanics	171	200	396_1	168	98_1	18	48.3_2
carburetor	325_2	200	327	168	45	18	49.8_2
fuel economy	171	200	327	168	98_1	18	45.2_1
transmission of power	325_2	200	327	168	45	18	49.8_2
clutch	325_2	200	327	168	45	18	49.8_2
flywheel	325_2	200	327	168	45	18	49.8_2
gears	325_2	200	327	168	45	18	49.8_2
differential	325_2	200	327	168	45	18	49.8_2
brakes	325_2	200	327	168	45	18	49.8_2
to keep a car in good repair	171	200	327	168	98_1	18	45.2_1
important accessories and special advantages of	171	200	327	168	98_1	18	45.2_1
localization of automobile industry in Michigan and Ohio	238_1	200	327	168	45	18	45.8_1
difference between, and advantages of 4, 6, 8 and 12 cylinder engines	237_1	200	327	168	45	18	45.8_1
tractors and tanks	237_1	200	327	168	45	18	45.8_1
tires — durability and cost	171	200	327	168	98_1	18	45.2_1
good roads and automobiles	238_1	200	327	168	45	18	45.8_1
steam automobiles	237_1	200	327	168	45	18	45.8_1
leather	171	200	327	168	98_1	18	45.2_1
identification of cowhide and pigskin	171	200	327	168	98_1	18	45.2_1
identification of calfskin	171	200	327	168	98_1	18	45.2_1
identification of sheepskin	171	200	327	168	98_1	18	45.2_1
identification of grain seal	171	200	327	168	98_1	18	45.2_1
identification of walrus	171	200	327	168	98_1	18	45.2_1
identification of alligator	171	200	327	168	98_1	18	45.2_1
identification of grain and split leathers	171	200	327	168	98_1	18	45.2_1
leather finishes: suede, morocco, cordovan, levant, enamel	171	200	327	168	98_1	18	45.2_1
identification of imitation leathers	171	200	327	168	98_1	18	45.2_1
preservation of leather by use of vaseline	171	200	327	168	98_1	18	45.2_1
rugs	171	200	327	168	98_1	18	45.2_1
wool-fibre rugs	171	200	327	168	98_1	18	45.2_1
merits and defects	171	200	327	168	98_1	18	45.2_1
all-fibre rugs: merits	171	200	327	168	98_1	18	45.2_1
WATER	463_3	438_4	595_5	302_2	98_1	36_1	88.9_{16}
life in	266_1	200	327	168	45	18	47.1_1
uses to familiar plants and animals living in or near	333_2	200	327	168	45	18	50.2_2
uses to camels	257_1	200	327	168	45	18	46.7_1
water cycle	333_2	307_2	523_4	221_1	45	36_1	67.5_{10}
conditions which result in springs	333_2	257_1	327	168	45	18	52.9_3
conditions which result in streams	171	255_1	383_1	168	45	18	47.8_2
conditions which result in lakes	171	255_1	390_1	168	45	18	48.2_2
conditions which result in oceans	171	243_1	327	168	45	18	44.7_1
causal relations of bodies of water	333_2	302_2	468_3	168	45	36_1	62.2_8
evaporation	333_2	302_2	468_3	168	45	36_1	62.2_8

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
WATER — Continued							
factors in evaporation	238_1	200	327	168	45	18	45.8_1
condensation	333_2	302_2	400_2	168	45	36_1	59.1_7
climatic effects of bodies of water	333_2	255_1	327	221_1	45	18	55.2_4
unequal heating and cooling of land and water	333_2	200	327	168	45	18	50.2_2
lake, river and sea breezes	333_2	255_1	327	168	45	18	52.8_3
effects of shore and lake climates upon farm crops	266_1	200	327	220_1	45	18	49.6_2
effects of shore and lake climates upon industries	266_1	200	327	168	45	18	47.1_1
importance and work of streams and other bodies of water	352_2	353_2	441_2	168	45	36_1	64.3_8
drainage	266_1	353_2	356_1	168	45	36_1	56.1_6
mountains as water sheds	266_1	200	327	168	45	18	47.1_1
river basins	266_1	255_1	327	168	45	18	49.6_2
as water reservoirs	266_1	200	327	168	45	18	47.1_1
ground water	171	257_1	327	168	45	36_1	46.2_2
caves	171	257_1	327	168	45	36_1	46.2_2
underground streams	171	200	385_1	168	45	18	45.4_1
soil makers and distributors	266_1	255_1	327	168	45	18	49.7_2
water power	266_1	251_1	327	168	45	18	49.5_2
flood makers	266_1	200	327	168	45	18	47.1_1
transportation	352_2	256_1	327	168	45	18	53.7_2
river development	171	241_1	327	168	45	18	44.6_1
early steps leading to present-day methods of transportation	257_1	200	327	168	45	18	46.7_1
steering of boats	257_1	200	327	168	45	18	46.7_1
source of food	266_1	200	383_1	168	45	18	49.7_2
fishing	171	200	383_1	168	45	18	45.3_1
means of recreation	266_1	200	327	168	45	18	47.1_1
occurrence of water	238_1	200	382_1	168	45	18	48.4_2
in air, as vapor	238_1	200	382_1	168	45	18	48.4_2
in crystals, chemically combined	238_1	200	350_1	168	45	18	46.9_2
in soil	238_1	200	327	168	45	18	45.8_1
characteristics of water	333_2	435_4	456_3	245_1	45	35_1	71.4_{11}
chemical properties of water	238_1	315_2	327	168	45	35_1	52.0_4
composition of water	238_1	255_1	327	168	45	35_1	49.2_3
electrolysis	238_1	297_2	327	168	45	35_1	51.1_4
hydrogen, preparation and properties	171	254_1	327	168	45	18	45.2_1
physical properties of water	266_1	327_2	408_2	168	45	18	56.7_5
solutions	171	248_1	350_1	168	45	18	46.0_2
diffusion of liquids	238_1	293_2	350_1	168	45	18	51.2_4
chemical change helped by solution	171	200	350_1	168	45	18	43.8_1
crystals	238_1	200	350_1	168	45	18	46.9_2
capillarity	266_1	291_2	408_2	168	45	18	55.0_5
cohesion	171	289_2	350_1	168	45	18	47.9_3
adhesion	171	289_2	398_2	168	45	18	50.1_4
forms of water	377_2	356_3	590_5	168	45	18	71.5_{10}
liquid	171	258_1	327	168	45	18	45.4_1
solid (ice)	238_1	258_1	494_3	168	45	18	56.2_3
changes in volume due to freezing	238_1	200	350_1	168	45	18	46.9_2
use of salt in freezing ice cream	238_1	200	384_1	168	45	18	48.5_2
manufacture of artificial ice	238_1	352_3	380_1	168	45	18	55.3_5
gas, as in steam and water vapor	238_1	303_2	451_2	168	45	18	56.3_5

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
WATER — Continued							
how water boils	238_1	200	383_1	168	45	18	48.4_2
preparation and nature of distilled water	377_2	293_2	350_1	168	45	18	57.5_5
uses	238_1	200	327	168	45	18	45.8_1
altitude and pressure	238_1	200	327	168	45	18	45.8_1
use of pressure cooker	238_1	200	327	168	45	18	45.8_1
expansive power of steam	238_1	200	327	168	45	18	45.8_1
popcorn	171	200	385_1	168	45	18	45.4_1
water supply	463_3	435_4	407_2	168	98_1	18	73.1_{10}
home water supply	463_3	422_4	407_2	168	98_1	18	72.5_{10}
sources in rural and urban areas	377_2	200	327	168	45	18	52.2_2
springs	376_2	200	327	168	45	18	52.2_2
artesian wells	376_2	200	327	168	98_1	18	54.6_3
water mains, pumps, pipes, faucets	377_2	200	327	168	98_1	18	54.7_3
care of faucets	377_2	200	327	168	45	18	52.2_2
gravity and pumping systems	396_2	200	327	168	45	18	53.1_2
pneumatic house systems	443_3	200	327	168	45	18	55.3_3
plumbing	333_2	315_2	327	168	98_1	18	57.9_5
materials for water and gas pipes	238_1	200	327	168	45	18	45.8_1
repairing a leak by soldering	238_1	200	327	168	98_1	18	48.3_2
traps, cut-offs and joints	333_2	200	327	168	98_1	18	52.7_3
circulation of hot water	238_1	200	327	168	45	18	45.8_1
prevention of rust	238_1	200	327	168	45	18	45.8_1
prevention of freezing	238_1	200	327	168	98_1	18	48.3_2
prevention of accumulation of sediment in pipes	238_1	200	327	168	45	18	45.8_1
importance of unpolluted water in home	463_3	301_2	407_2	168	45	18	64.5_7
dangers from faucet filters	309_1	200	327	168	45	18	49.1_1
sanitary control of water supply	463_3	393_3	384_1	168	45	18	67.7_7
care and protection of sources	377_2	200	327	168	45	18	52.2_2
rural and city supply problems	463_3	200	327	168	45	18	56.2_3
Los Angeles supply	237_1	200	327	168	45	18	45.8_1
New York City supply	237_1	200	327	168	45	18	45.8_1
types of water systems	266_1	200	327	168	45	18	47.1_1
water supply in the community	448_3	260_1	384_1	168	45	18	60.9_5
vacation dangers and how avoided	396_2	200	327	168	45	18	53.1_2
treatment of polluted water	396_2	200	327	168	45	18	53.1_2
impurities in water	325_2	260_1	327	168	45	18	52.6_2
dissolved solids	238_1	200	327	168	45	18	45.8_1
bacteria and protozoa	238_1	200	327	168	45	18	45.8_1
sediments of undissolved sand	238_1	200	327	168	45	18	45.8_1
filtering systems	305_2	260_1	327	168	45	18	51.7_3
settling basins	325_2	260_1	327	168	45	18	52.6_2
chemical treatment	237_1	260_1	327	168	45	18	48.6_2
chlorine	171	244_1	327	168	45	18	44.8_1
daily tests of purity	325_2	200	327	168	45	18	49.8_2
cost of water to consumer	325_2	200	327	168	45	18	49.8_2
comparative advantages of flat and meter rates	325_2	200	327	168	45	18	49.8_2
distribution	325_2	200	327	168	45	18	49.8_2
pumping stations	325_2	200	327	168	45	18	49.8_2
maintaining pressure	238_1	200	327	168	45	18	45.8_1
water and health	325_2	200	327	168	98_1	18	52.3_3
importance of drinking sufficient water	238_1	200	327	168	45	18	45.8_1
water and body temperature — perspiration	238_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
WATER — Continued							
humidity of living and school rooms	325_2	200	327	168	98_1	18	52.3_3
bathing	238_1	200	327	168	45	18	45.8_1
causal relations between energy of sun and evaporation, rainfall, waterfall, and passage of water through mains to house faucet	294_1	200	327	168	45	18	48.4_1
forest conservation in relation to water supply	294_1	200	327	168	45	18	48.4_1
some uses of water in home	420_3	352_3	381_1	168	98_1	18	66.1_8
cleansing agent	420_3	300_2	327	168	45	18	58.8_5
cleansing solution	171	245_1	327	168	45	18	44.8_1
hard and soft water	420_3	254_1	327	168	45	18	56.7_4
soap for hard water	171	200	327	168	98_1	18	45.2_1
soap and soap substitutes	420_3	200	381_1	168	98_1	18	59.1_5
acids and alkalies	266_1	200	327	168	45	18	47.1_1
scouring powders	238_1	200	327	168	45	18	45.8_1
liquid cleaners	238_1	200	327	168	45	18	45.8_1
bluing	171	200	379_1	168	45	18	45.1_1
value and method of using laundry machinery	420_3	243_1	327	168	45	18	56.2_4
flushing wastes from home	266_1	200	327	168	45	18	47.1_1
sinks, drains and toilets	266_1	200	327	168	45	18	47.1_1
home investigation of structure and care of flushing apparatus	266_1	200	327	168	45	18	47.1_1
sewage disposal	361_2	351_3	327	168	98_1	18	60.9_6
importance and relation to water supply	361_2	200	327	168	98_1	18	53.9_3
common methods of disposal in rural and urban areas	294_1	200	327	168	45	18	48.4_1
modern methods of disposal in rural and urban areas	294_1	200	327	168	45	18	48.4_1
septic tank	294_1	200	327	168	45	18	48.4_1
sedimentation bed	294_1	200	327	168	45	18	48.4_1
cesspool	171	200	327	168	98_1	18	45.2_1
principle and relative efficiency of each type	294_1	200	327	168	45	18	48.4_1
water and its work	463_3	435_4	441_2	249_1	45	18	76.0_{10}
water pressure	377_2	200	327	168	45	18	52.2_2
how used and controlled	266_1	200	327	168	45	18	47.1_1
construction, care and control of hot water boiler	377_2	200	327	168	45	18	52.2_2
steam	420_3	424_4	383_1	168	45	18	67.1_8
evolution and history of steam power	325_2	200	327	168	45	18	49.8_2
parts and operating of steam engine	325_2	424_4	383_1	168	45	18	62.7_7
pressure gauges and governor	237_1	200	327	168	45	18	45.8_1
use of steam in hoists, autos and dredges	238_1	200	327	168	45	18	45.8_1
steam turbine	257_1	200	327	168	45	18	46.7_1
importance of steam railway	237_1	200	327	168	45	18	45.8_1
Fulton and the steamboat	237_1	200	327	168	45	18	45.8_1
work of Newcomen	325_2	200	327	168	45	18	49.8_2
work of Watt	420_3	200	327	168	45	18	54.2_3
work of Stevenson	420_3	200	327	168	45	18	54.2_3
mechanics of water	325_2	434_4	502_3	249_1	45	18	72.4_{10}
siphon	305_2	292_2	327	168	45	18	53.2_4
construction	238_1	200	327	168	45	18	45.8_1
forces operating	238_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
WATER — Concluded							
limitation	238_1	200	327	168	45	18	45.8_1
uses	238_1	200	327	168	45	18	45.8_1
lift and force pumps	325_2	358_3	327	168	45	18	57.1_5
parts	238_1	200	327	168	45	18	45.8_1
operation	238_1	200	327	168	45	18	45.8_1
limitation	238_1	200	327	168	45	18	45.8_1
uses	238_1	255_1	327	168	45	18	48.4_2
principle of transmission of pressure in liquids	238_1	200	327	168	45	18	45.8_1
hydraulic press	238_1	240_1	385_1	168	45	18	50.4_3
uses in cotton industry	238_1	200	327	168	45	18	45.8_1
uses in barbers' and dentists' chairs	238_1	200	327	168	45	18	45.8_1
uses in some elevators	238_1	200	327	168	45	18	45.8_1
Archimedes' principle	325_2	327_2	502_3	168	45	18	63.7_7
buoyancy	325_2	327_2	502_3	168	45	18	63.7_7
why iron ships float	325_2	200	327	168	45	18	49.8_2
apparent loss of weight of objects submerged in water	325_2	200	327	168	45	18	49.8_2
operation of submarines	325_2	200	327	168	45	18	49.8_2
concrete boats	257_1	200	327	168	45	18	46.7_1
wooden vessels	257_1	200	327	168	45	18	46.7_1
drydocks	237_1	200	327	168	45	18	45.8_1
density	238_1	380_3	431_2	168	45	36_1	59.7_7
water the standard	238_1	200	327	168	45	18	45.8_1
specific gravity	238_1	380_3	327	168	45	18	54.1_4
irrigation	238_1	353_3	376_1	248_1	45	36_1	59.7_7
climatic conditions necessitating	238_1	200	327	168	45	18	45.8_1
less than 25 in. precipitation per year	238_1	200	327	168	45	18	45.8_1
high rate of evaporation	238_1	200	327	168	45	18	45.8_1
even distribution of rainfall throughout year	238_1	200	327	168	45	18	45.8_1
states in which necessary for agriculture	238_1	200	327	168	45	18	45.8_1
sources of water for irrigation	238_1	200	327	168	45	18	45.8_1
mountain snows, glaciers, streams, reservoirs	238_1	200	327	168	45	18	45.8_1
crops best adapted to irrigation	238_1	200	327	168	45	18	45.8_1
WEATHER AND CLIMATE	463_3	445_4	692_6	344_3	98_1	37_1	95.7_{18}
in relation to principal crops	361_2	200	327	168	45	18	51.5_2
in relation to leading industries	361_2	200	327	168	45	18	51.5_2
in relation to common occupations	361_2	200	327	168	45	18	51.5_2
in relation to general health	361_2	200	327	168	45	18	51.5_2
the weather	463_3	445_4	692_6	344_3	98_1	37_1	95.7_{18}
superstitions and weather signs	333_2	200	327	168	45	18	50.2_2
origin of weather lore	238_1	200	327	168	45	18	45.8_1
meaning	266_1	200	327	168	45	18	47.1_1
effects upon people	266_1	200	327	168	45	18	47.1_1
weather factors	463_3	311_2	682_6	168	98_1	37_1	81.0_{13}
temperature	463_3	311_2	465_3	168	98_1	37_1	70.9_{10}
thermometer	420_3	311_2	350_1	168	45	18	60.4_6
construction	238_1	200	327	168	45	18	45.8_1
use of mercury	238_1	200	327	168	45	18	45.8_1
other liquids used	238_1	200	327	168	45	18	45.8_1
system of scaling Fahrenheit	238_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
WEATHER AND CLIMATE — Continued							
system of scaling Centigrade	238_1	200	327	168	45	18	45.8_1
boiling point of water on each	238_1	304_2	350_1	168	45	18	51.7_4
freezing point of water on each	238_1	304_2	350_1	168	45	18	51.7_4
maximum and minimum thermometers and their use	238_1	200	327	168	45	18	45.8_1
adaptations for special uses	238_1	200	327	168	45	18	45.8_1
air pressure	463_3	260_1	327	168	45	18	59.0_4
wind	463_3	309_2	661_8	168	45	37_1	77.4_{11}
nature	333_2	200	327	168	45	18	50.2_2
causes	333_2	200	327	168	45	18	50.2_2
conditions determining direction and velocity	309_1	200	327	168	45	18	49.1_1
general circulation	171	249_1	327	168	45	18	45.0_1
wind power	325_2	292_2	327	168	45	18	54.0_4
for sail boats and windmills	325_2	292_2	327	168	45	18	54.0_4
humidity	463_3	368_3	590_4	168	98_1	37_1	79.4_{12}
how water is taken into air (evaporation)	333_2	302_2	468_3	168	45	18	61.4_7
dewpoint	171	251_1	327	168	45	18	45.1_1
variable amount	238_1	200	327	168	45	18	45.8_1
relation to health	325_2	200	327	168	98_1	18	52.3_3
saturation	171	251_1	327	168	45	18	45.1_1
precipitation	463_3	260_1	590_4	168	45	37_1	72.0_9
kinds	463_3	260_1	588_4	168	45	18	71.0_8
sleet	238_1	200	327	168	45	18	45.8_1
snow	377_2	200	586_4	168	45	18	64.1_6
rain	377_2	200	590_4	168	45	18	64.3_6
mist	238_1	200	327	168	45	18	45.8_1
fog	309_1	200	452_2	168	45	18	54.9_3
hail	309_1	200	431_2	168	45	18	53.9_3
frost	171	200	386_1	168	45	18	45.5_1
dew	309_1	200	327	168	45	18	49.1_1
rainless regions	257_1	200	327	168	45	18	46.7_1
clouds	333_2	200	652_8	168	45	36_1	66.0_8
reasons for formation	238_1	200	327	168	45	18	45.8_1
kinds and movements	238_1	200	327	168	45	18	45.8_1
a protection against frost	238_1	200	327	168	45	18	45.8_1
storms	463_3	307_2	667_5	168	45	35_1	77.6_{11}
cause of	171	307_2	327	168	45	18	47.7_2
general storm areas	463_3	200	437_2	168	45	35_1	62.1_6
high and low pressure areas — cyclones	377_2	200	380_1	168	45	35_1	55.5_4
hot and cold waves	377_2	200	327	168	45	18	52.2_2
storm paths in the U. S.	396_3	200	327	168	45	18	53.1_2
common types of storms	377_2	298_3	667_5	168	45	18	72.4_9
local	377_2	251_1	667_5	168	45	18	70.2_8
thunderstorms	377_2	251_1	667_5	168	45	18	70.2_8
thunder	171	251_1	602_4	168	45	18	57.7_5
lightning	171	251_1	667_5	168	45	18	60.7_6
destruction by and protection from thunderstorms	309_1	200	327	168	45	18	49.1_1
tornadoes	238_1	200	454_2	168	45	18	51.7_2
water spouts	238_1	200	327	168	45	18	45.8_1
hurricanes	238_1	200	327	168	45	18	45.8_1
blizzards	238_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	Groups of Sources						Final Relative Value
	A	B	C	D	E	F	
WEATHER AND CLIMATE — Continued							
weather predictions	448_3	309_2	441_2	168	45	18	65.8_7
local conditions	294_1	200	327	168	45	18	48.4_1
from weather signs	294_1	200	327	168	45	18	48.4_1
by newspaper reports	294_1	200	327	168	45	18	48.4_1
by radio reports	294_1	200	327	168	45	18	48.4_1
general weather conditions	294_1	200	327	168	45	18	48.4_1
by U. S. weather bureau reports	294_1	200	327	168	45	18	48.4_1
by U. S. weather maps	294_1	200	327	168	45	18	48.4_1
weather bureau	420_3	255_1	327	168	45	18	56.8_4
organization and support	238_1	200	327	168	45	18	45.8_1
instruments	238_1	200	327	168	45	18	45.8_1
records and publications	448_3	309_2	327	168	45	18	60.5_5
bureau reports	380_2	259_1	327	168	45	18	55.1_3
weather maps	448_3	309_2	327	168	45	18	60.5_5
reading of U. S. weather maps	294_1	250_1	327	168	45	18	50.7_2
their value and importance	420_3	250_1	327	168	45	18	56.5_4
aid to farmer, shipper and navigator	420_3	255_1	327	168	45	18	56.8_4
signals	257_1	200	327	168	45	18	46.7_1
climate	420_3	252_1	498_3	221_1	45	18	66.9_8
as distinguished from weather	240_1	252_1	327	168	45	18	48.3_2
climatic factors	240_1	252_1	327	168	45	18	48.3_2
latitude	240_1	200	327	168	45	18	45.9_1
altitude	240_1	200	327	168	45	18	45.9_1
position on continent	240_1	200	327	168	45	18	45.9_1
location as to wind belts	240_1	200	327	168	45	18	45.9_1
nearness to mountains	240_1	200	327	168	45	18	45.9_1
oceanic currents	171	243_1	327	168	45	18	44.7_1
adaptations of plants and animals to climatic conditions	420_3	243_1	454_2	168	45	18	62.0_6
dwarf habit and bright colored bloom of high-altitude flowering plant	240_1	200	327	168	45	18	45.9_1
protective coloring of polar bear	240_1	200	327	168	45	18	45.9_1
large chest development of Inca Indians in high altitude	240_1	200	327	168	45	18	45.9_1
hibernation	171	200	454_2	168	45	18	48.6_2
type studies of climatic regions	240_1	200	327	168	45	18	45.9_1
British Isles, oceanic	240_1	200	327	168	45	18	45.9_1
Mississippi valley, continental	240_1	200	327	168	45	18	45.9_1
Congo valley, equatorial rain belt	240_1	200	327	168	45	18	45.9_1
effect of climate on people and progress	325_2	200	327	221_1	45	18	52.3_2
temperature and human progress	325_2	200	327	168	45	18	49.8_2
detailed study of typical hot country	238_1	200	327	221_1	45	18	48.3_2
its location in reference to North America, Europe and Asia	238_1	200	327	168	45	18	45.8_1
trade routes by which it may be reached	238_1	200	327	168	45	18	45.8_1
influence of its location on its climate	238_1	200	327	221_1	45	18	48.3_2
location as to prevailing winds	238_1	200	327	168	45	18	45.8_1
position on continent	238_1	200	327	168	45	18	45.8_1
influence of mountain ranges	238_1	200	327	168	45	18	45.8_1
nearness to ocean	238_1	200	327	168	45	18	45.8_1
plant and animal life adaptations to heat conditions	238_1	200	327	221_1	45	18	48.3_2
inhabitants: native and foreign — manner of life, progress	238_1	200	327	168	45	18	45.8_1

TABLE VII — Continued

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
WEATHER AND CLIMATE — Concluded							
Arctic, temperate and tropic peoples	325_2	200	327	168	45	18	49.8_2
their progress	257_1	200	327	168	45	18	46.7_1
industries and products; reasons for limitation	325_2	200	327	168	45	18	49.8_2
future development	325_2	200	327	168	45	18	49.8_2
MISCELLANEOUS TOPICS							
anæsthetic	171	200	378_1	168	45	18	45.0_1
history of science	352_2	200	603_4	248_1	45	18	67.5_7
great scientists	352_2	200	327	248_1	45	18	54.8_3
Priestly and Lavoisier	266_1	200	327	168	45	18	47.1_1
molecular theory	333_2	375_3	398_2	168	45	18	61.5_7
chemistry	171	273_1	512_3	248_1	45	18	58.3_5
distinction between organic and inorganic	171	240_1	327	168	45	18	44.6_1
processes	171	200	327	248_1	45	18	46.4_1
flocculation	171	250_1	327	168	45	18	45.0_1
colloids	171	200	327	245_1	45	18	46.3_1
discoveries	171	200	327	248_1	45	18	46.4_1
laws	171	200	327	246_1	45	18	46.3_1
atomic weight	171	200	327	247_1	45	18	46.4_1
law of definite proportion	171	240_1	327	168	45	18	44.6_1
periodic system	171	200	327	248_1	45	18	46.5_1
destructive distillation of wood and coal	171	250_1	327	168	45	18	45.0_1
analysis and synthesis	171	240_1	327	247_1	45	18	48.2_2
household chemistry	171	271_1	459_2	168	45	18	52.0_3
ammonia	171	273_1	327	168	45	18	46.1_1
salt	171	273_1	327	168	45	18	46.1_1
soda	171	200	384_1	168	45	18	45.3_1
chemistry of foods	171	200	385_1	168	45	18	45.4_1
taxidermy	171	200	376_1	168	45	18	45.0_1
physical laws, general definition	171	240_1	327	168	45	18	44.6_1
relativity	171	200	393_1	168	45	18	45.7_1
weights and measures	171	363_3	381_1	168	45	18	52.7_4
metric system	171	242_1	327	168	45	18	44.7_1
world commerce and transportation	171	247_1	327	221_1	45	18	47.3_2
organization of producers	171	200	327	221_1	45	18	45.2_1
for social and economic welfare	171	200	327	220_1	45	18	45.2_1
for improvement of product	171	200	327	219_1	45	18	45.1_1
economic problems, wages, industry, etc.	171	240_1	327	168	45	18	44.6_1
principles of civilization	171	240_1	327	168	45	18	44.6_1
economy in the home, general	171	240_1	327	168	45	18	44.6_1
nature	171	200	384_1	221_1	45	18	47.8_2
man's relation to nature	171	244_1	327	168	45	18	44.8_1
nature education	171	200	327	220_1	45	18	45.2_1
recreational value	171	200	327	219_1	45	18	45.1_1
conservation	171	200	327	218_1	45	18	45.1_1
drawing, the art of	171	240_1	327	168	45	18	44.6_1
cleansers and polishes	171	245_1	327	168	98_1	18	47.2_2
softening due to oil and water	171	200	350_1	168	45	18	43.8_1
soap making	171	245_1	327	168	45	18	44.8_1
good laundry soap	171	200	327	168	98_1	18	45.2_1
good toilet soap	171	200	327	168	98_1	18	45.2_1
raw materials of soap	171	200	327	168	98_1	18	45.2_1
basic fat or oil in soap	171	200	327	168	98_1	18	45.2_1

TABLE VII — Concluded

TOPIC	GROUPS OF SOURCES						Final Relative Value
	A	B	C	D	E	F	
MISCELLANEOUS TOPICS — Concluded							
relative cleaning quality of soap	171	200	327	168	98_1	18	45.2_1
hard and soft soap	171	200	327	168	98_1	18	45.2_1
appropriate uses	171	200	327	168	98_1	18	45.2_1
pure soap	171	200	327	168	98_1	18	45.2_1
medicated soap	171	200	327	168	98_1	18	45.2_1
chemicals in cleaning and polishing preparations	171	200	327	168	98_1	18	45.2_1
dangers in use	171	200	327	168	98_1	18	45.2_1
advantages of newly discovered preparations	171	200	327	168	98_1	18	45.2_1
to make simple solutions, sold under trade names	171	200	327	168	98_1	18	45.2_1
appropriate preparations for different household uses	171	200	327	168	98_1	18	45.2_1
chief ingredients of metal polishes and paste polishes	171	200	327	168	98_1	18	45.2_1
preparations which injure metals	171	200	327	168	98_1	18	45.2_1
identification of common cleansers and polishes as borax, sodium carbonate, caustic potash, caustic soda, lye, camphor, sulphur	171	200	327	168	98_1	18	45.2_1
miscellaneous household articles	171	200	327	168	98_1	18	45.2_1
adhesives: glue, mucilage, paste, cement	171	200	327	168	98_1	18	45.2_1
appropriate uses of each	171	200	327	168	98_1	18	45.2_1
water resisting glue	171	200	327	168	98_1	18	45.2_1
brushes	171	200	327	168	98_1	18	45.2_1
appropriate ones for various uses	171	200	327	168	98_1	18	45.2_1
vegetable and animal bristles	171	200	327	168	98_1	18	45.2_1
relative value of pyroxylin and bone brush backs	171	200	327	168	98_1	18	45.2_1
relative values of pyroxylin and ivory backs	171	200	327	168	98_1	18	45.2_1

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